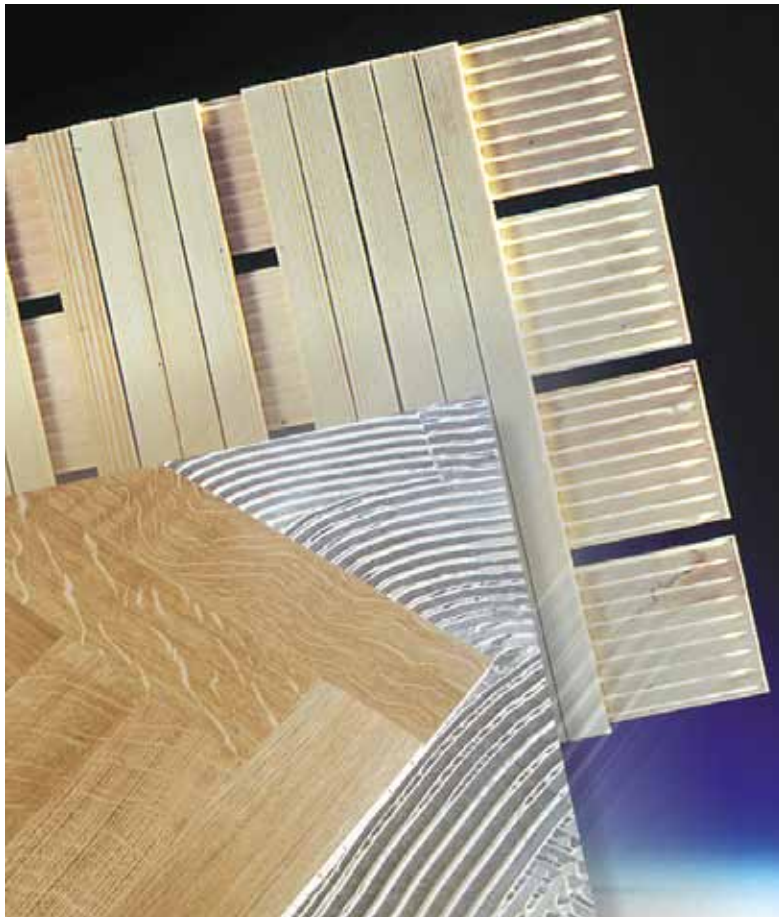




KLEIBERIT®

ADHESIVES • COATINGS



In-Line production of two layer parquet flooring with reactive PUR hotmelts



2-layer parquet

Competence **PUR**



KLEBCHEMIE M. G. Becker GmbH & Co. KG, producer of **KLEIBERIT** products – modern and innovative. The company’s competence is especially reflected in the tremendous development and productivity in PUR-adhesives, which is why **KLEIBERIT** products have become one of the market leaders in this future technology sector – worldwide!

In our modern laboratories, experienced, innovative and highly qualified chemists develop high quality products in accordance to customer requirements. Emphasis is placed on the development of environmentally friendly and ecologically clean adhesives.

Our applications laboratory has an extensive range of machinery, so our skilled technicians and engineers are able to conduct tests under “real life” conditions.

The combination of our inbound quality control, production quality control and constant product development ensures that our customers will only receive quality products.

KLEIBERIT products are being used worldwide by many well known companies in the wood-working, plastics and automotive industries.

Modern
Technology,
Know-how,
Commitment...

... are the components
that determine
success – today and
in the future.



- PUR-Adhesive: One and two components
- PUR-Hotmelts, PUR-Glue
- Dispersions: PUR, EVA, PVAC
- Hotmelts: PUR, EVA, PO, PA, PE
- Two component PUR and Epoxy Systems
- Foams and Sealing Compounds
- Solvent based Adhesives

Working internally and in the field, our highly motivated employees always provide the best customer service through excellent customer care, high quality technical assistance, fast order processing, and quick, worldwide delivery.



... we hold the
world together

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In cooperation with **KLEBCHEMIE** a method for in-line production of 2-ply parquet was developed about ten years ago.

Advantages:

- free of formaldehyde and solvent
- very fast setting
- In-line bonding process possible – press times in the range of seconds (not possible with dispersions)
- joint line flexible even after setting (no creaking when weight is put on it)
- chemical crosslinking gives very good temperature and humidity resistance (improvement over current D4-dispersions)

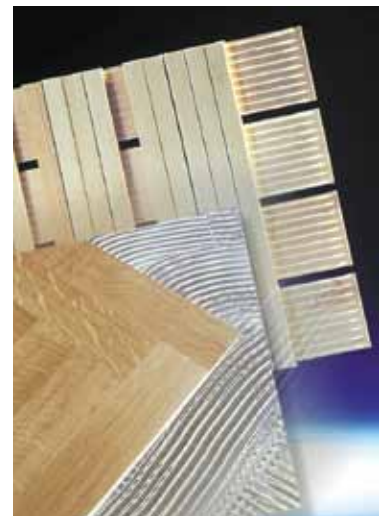
Procedure:

The adhesive is applied in beads to the back of the top layer with several top layers passed through a chamber having a multitude of nozzles. Parallel to that the strips (later the bottom-layer of the 2 ply parquet) are sorted and aligned. Strips are picked up by vacuum and by means of a rotation arm turned by 90° and placed on the adhesive covered top layers, then put in the press. The press is closed. This cycle time of the process takes a few seconds. In a circular series a number of these presses are arranged. The press time is 15-30 seconds per unit depending on the arrangement. The press is opened and the bonded parquet is transported by a conveyor belt to a stacking device and automatically stacked.

More information and recommendation

- Further processing (polishing, varnishing) should be put back 24 hours
- The wood tolerances of the wear – and under layer should be in the range of $\pm 0,1$ mm
- The wood moisture should be between 8-10%
- Application quantity of PUR HM 140 ± 10 g/m²

KLEIBERIT 707/705 PUR Hotmelt



View of the application device with more than 100 adhesive application nozzles.



Table of Variables showing the construction of the flooring planks tested

Test Groups	Sublayer species	Wear layer species
Variant 1	Hevea	Hevea
Variant 2	MDF	Beech
Variant 3	Oak	Ash
Variant 4	Oak	Oak
Variant 5	Oak	Sipo
Variant 6	Beech	Plywood

Note: the adhesive was applied to the back of the wear layer in parallel beads *running with the grain of the sawn components*, or applied to the pickets in parallel lines running 90° to the pickets. When the sublayer was composed of pickets (wood strips) these were bonded @ 90° to the orientation of the adhesive beads on the wear layer.

Note: The test specimens were gathered from 4 separate manufacturers of 2 ply engineered flooring. All were at the time of the preparation of this report using KLEIBERIT PUR hotmelt 707/705 in their manufacturing process.

Test Descriptions and Methods

- **Accelerated Ageing:** +40°C / 98% relative humidity, duration = 18 month
- **Bond Line Creep Testing:** A static weight applied for 18 month in ambient conditions, i.e. 20°C / 65 % relative humidity.
Downward force applied = 150 N to a plank measuring 155 mm in width and 10 mm in thickness.
The unsupported span was 2 x width = 310 mm. The Wood Grain ran 90° to the width. The resulting bending tension was approximately 4.5 N/mm² equivalent to 10 % of the demonstrated maximum for the plank. The sheer applied to the glue line was calculated to be 0.2 N/mm².
- **90° Sheer Strength Testing:** A test method was developed to evaluate the sheer strength of the glue line. A force was applied through a groove cut in the wear layer of the plank directed / 90° to the sublayer until a failure of substrate or glue line was observed.

Laboratory evaluation
of bond integrity in
2 ply flooring
planks constructed with
KLEIBERIT 707/705



Observations: The results of the Ageing testing on the materials reported suggest that the KLEIBERIT PUR hotmelt 707/705 has the required glue line flexibility to bond different types of wood species and various man made wood components together in a 2 layer composite. The variable levels of dimensional stability required for interior applications do not adversely affect the quality of the bond. In addition, we believe that the water resistance of the PU hotmelt is sufficient to ensure the good performance of 2 ply laminates in below grade construction.



The results of the testing under load suggest that the Kleiberit PUR hotmelt 707/705 has sufficient long term cohesive integrity to be used as a laminating adhesive for 2 ply flooring planks. This property allows for very good long term flex of the flooring plank after installation.

The results of the 90° Shear Strength Testing demonstrate the adhesive and cohesive properties of the KLEIBERIT PUR hotmelt 707/705. In all cases the adhesive strength exceeded the strength of one of the 2 components of the construction. The high cohesive strength will allow for 2 ply composites to be designed for installation via pneumatic nail guns.

Conclusion: The testing of the commercial 2 ply engineered flooring produced in Europe has shown the KLEIBERIT PUR hotmelt 707/705 to be an excellent adhesive to bond sawn wooden wear layers to various types of sublayer composites. The KLEIBERIT PUR hotmelt 707/705 exhibits special glue line and adhesion characteristics that are required for high performance in 2 ply laminate strip applications.

Note: our lab has made adhesion testing on a wide variety of wear layer species, please consult your KLEIBERIT sales Engineer for data on the species of your choice.

Results

Ageing testing:

6 of 6 test groups evaluated exhibited no appreciable degradation of bond integrity.

Bond Line Creep Testing:

6 of 6 test groups evaluated exhibited no measurable bond line creep.

90° Shear Strength Testing:

All failures were substrate, the adhesive and cohesive integrity of the bonds exceeded the strength of one of the components used in the construction of the flooring plank.



Transverse tension strength (adhesive strength) of 2-ply parquet under normal environmental conditions, warm/damp storage and long-term stationary tests under load, in normal environmental conditions.

Variante	Wood Type	Normal Climate reference +20°C/65% rel. hum. of air			*Climate Storage +40°C/98% rel. hum. of air			Strength Deterioration (%)	**Long-term Tests			Strength Deterioration (%)	Curvature Radius (r) with Bending Stress (σ_b)	
		σ_{\perp} (N/mm ²)	***V (%)	***HFA/KB (%)	σ_{\perp} (N/mm ²)	***V (%)	***HFA/KB (%)		σ_{\perp} (N/mm ²)	***V (%)	***HFA/KB (%)		r (mm)	σ_b (N/mm ²)
1	Hevea/Hevea	1,55	6,5	80/20	1,50	27	75/25	3,2	1,25	15,2	60/40	19	300	4,5
2	MDF/Beeche	1,35	10	100/0	1,30	15	100/0	3,7	1,26	10,3	100/0	6,7	275	4,5
3	Oak/Ash	1,85	15	80/20	1,70	21	75/25	8,1	1,65	17	80/20	10,8	285	4,5
4	Oak/Oak	2,00	11	80/20	1,75	26	75/25	12,5	1,98	9	80/20	1,0	275	4,5
5	Oak/Sipo	2,35	9	100/0	2,24	20	80/20	4,7	2,27	13	100/0	3,4	330	4,5
6	Beech/Plywood	2,15	11	100/0	2,10	15	70/30	2,3	1,75	8,6	100/0	18,6	560	5,5

* Climate storage (40/98) on 17.12.97 until 17.06.99 (18 months)

σ_{\perp} = Transverse tension strength following climate storage and return to normal environmental conditions.

** Long-term stationary in a normal climate following 12 months under load

σ_{\perp} = Transverse tension strength following long-term stationary test and sample release.

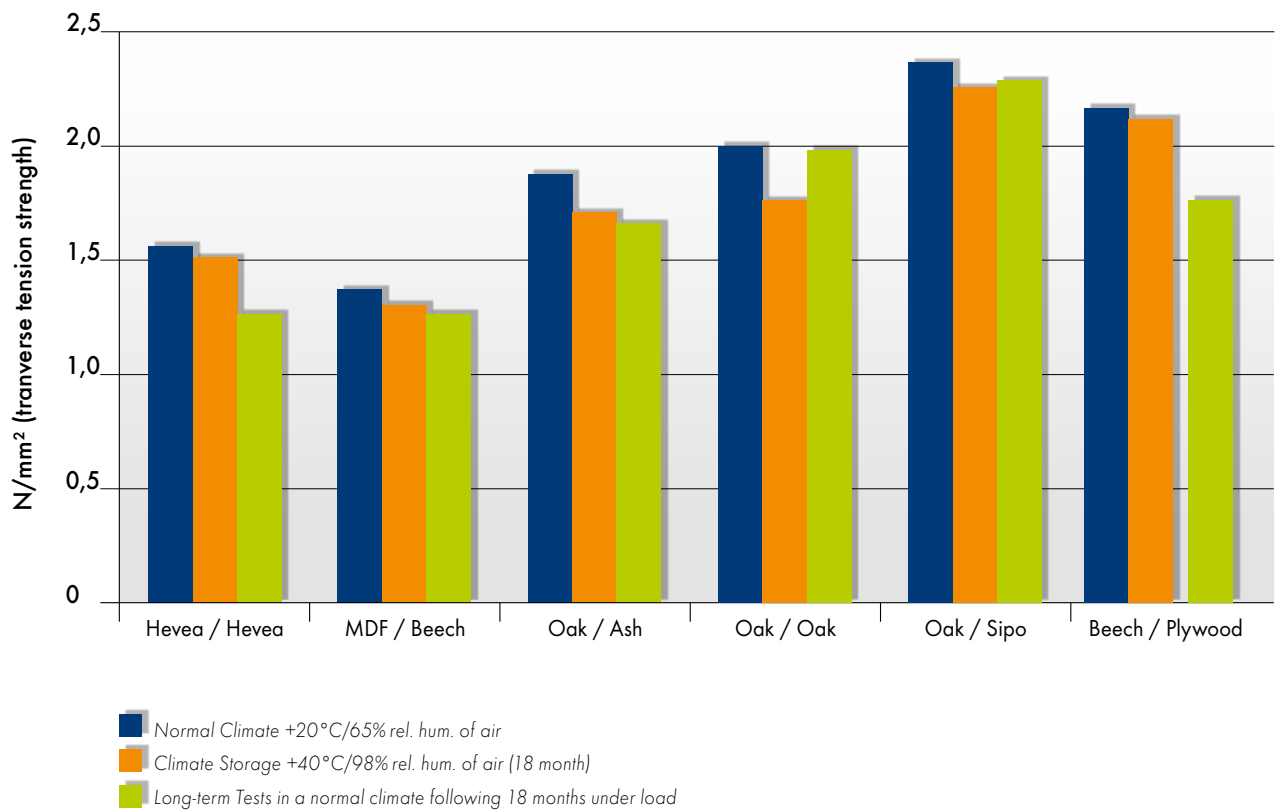
*** Valuation of the adhesive quality;

HFA/KB: wood grain split / cohesive break (%);

V = variation coefficient (%).



Transverse tension strength (adhesive strength) of 2-ply parquet





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