

AESTHETICS OF COMPOSITES WITH THE SURFACE DECORATIVE VENEERS MADE OF SILVER MAPLE (*Acer saccharinum* L.)

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- Silver maple - an introduced species for European wood-processing industry
- introduced to Europe from North America (from New Brunswick, along Maine, southern Quebec, and southern Ontario to Michigan and Minnesota, south to southeastern South Dakota, eastern Nebraska, and eastern Oklahoma, and east to Mississippi and Georgia)
- Silver maple is a member of the family *Aceraceae*



- **Silver maple (*Acer saccharinum* L.)** - interesting species for wood processing worldwide
- fully recommended for the European woodworking industry
- the quality of decorative veneers made from silver maple does not differ from the quality of the commonly used veneer for veneering in furniture industry when correct thickness is selected
- In Europe, because of the shortage of the high quality traditional raw material for decorative purposes, it is the time to start to utilize the suitable minor trees from the European forests

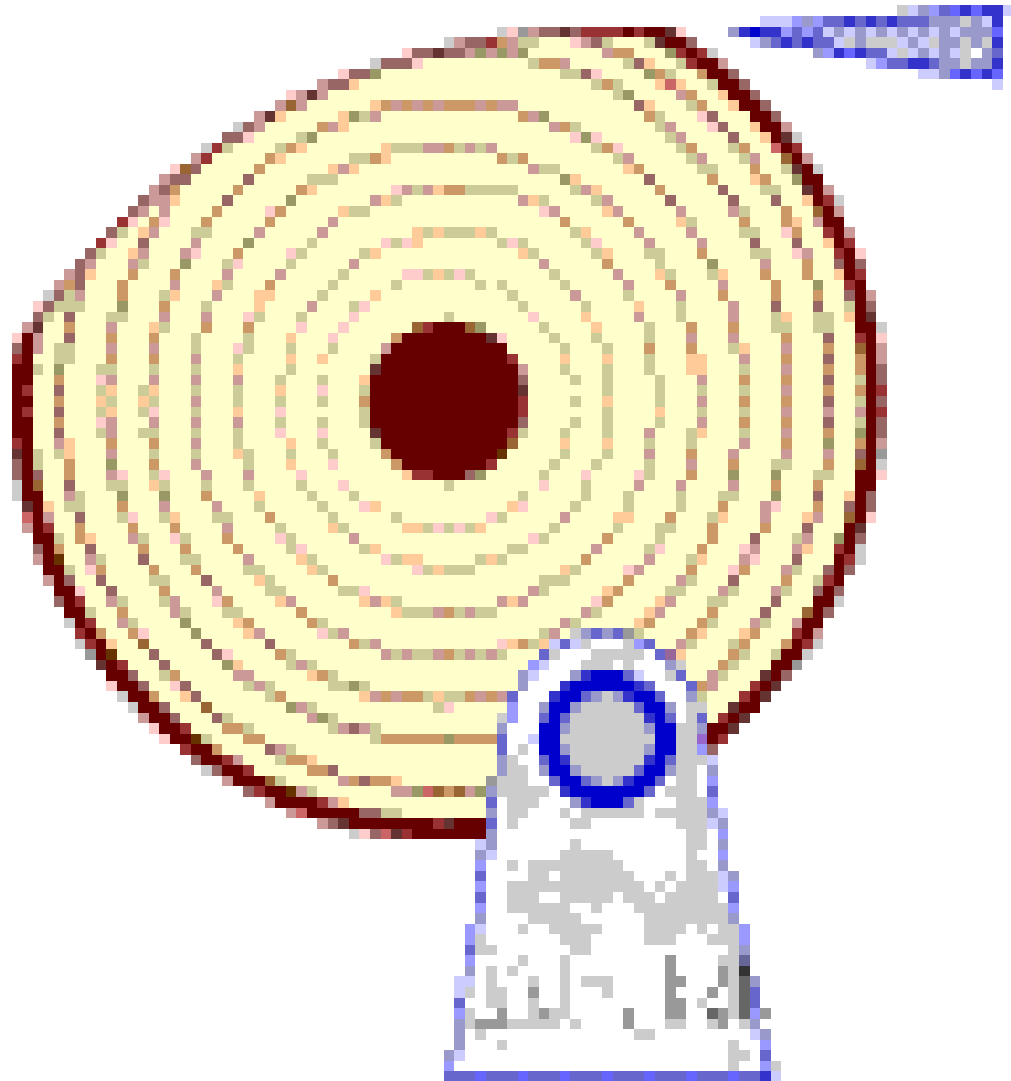
MATERIALS AND METHODS

- raw material for this research - Slovak origin
- from forests around the city of Palárikovo, region of Komárno
- 12 veneer logs with a length of 140 cm and with a diameter of 33.5 – 38.0 cm were not conditioned
- veneers were manufactured by off-center rotary cutting from fresh logs in the Technical University in Zvolen
- new and interesting grains and textures of silver maple were obtained
- veneers were dried up to a moisture content of $12 \pm 3 \%$ by drying at a temperature $110 \pm 5 \text{ }^\circ\text{C}$

Off-center rotary cutting

thicknesses:

- 0.5 mm
- 0.6 mm
- 0.7 mm
- 0.8 mm
- 0.9 mm



- veneers were subjected to a number of technological test procedures
- aim - to determine the most appropriate thickness of off-center cutting (eccentrically peeled) silver maple decorative veneer and the values of optimal glue mixture spread which is needed for veneering technology
- **Specific glue penetration to the veneered area**
- it was tested the range from 100 to 220 g.m⁻²
- veneering with urea-formaldehyde (UF) glue was carried out under the following conditions:
 - press pressure: 0.6 MPa
 - pressing temperature: 130 ° C
 - pressing time: 4 min

Table 1. Results of the specific glue penetration to the veneered area in dependence on the spread thickness

Veneer Thickness (mm)	Glue Spread (g.m ⁻²)								
	140	150	160	170	180	190	200	210	220
0.5	0.33	0.71	1.33	1.45	1.55	2.12	2.59	3.25	6.2
0.6	0.10	0.44	0.54	0.65	0.78	1.36	1.88	2.26	3.13
0.7	0.05	0.12	0.31	0.36	0.44	0.53	0.61	0.91	1.25
0.8	-	0.10	0.22	0.39	0.44	0.46	0.54	1.09	1.23
0.9	-	-	-	0.02	0.18	0.37	0.44	0.57	0.87

- no substantial glue penetration within the spread range 150 – 170 g.m⁻²
- there is no danger of devaluation of the veneered elements
- glue spread 140 – 150 g.m⁻² was proposed for PB

- **Veneer Adhesion to the Particleboard Substrate**
- adhesion between the veneers and the construction material was monitored
- heart of the test lies in the determination of the strength necessary for severing the veneer from the construction material by means of a cylinder made of light metal in a caliber of $19,8 \pm 0,1$ mm covered with epoxide glue
- for testing, samples of 50 x 50 mm in size were used

Table 2. Evaluation of Veneer Adhesion to Particleboard Substrate [MPa]

Glue Spread (g.m ⁻²)	t = 0.6 mm									
	1	2	3	4	5	6	7	8	9	10
140	1.5	1.2	2.1	1.8	2.6	2.8	2.1	2.9	2.1	2.3
150	1.3	1.7	1.8	3.8	3.1	3.5	4.1	3.9	2.1	3.7
160	2.8	1.3	1.6	1.9	1.6	2.5	3.1	1.1	2.1	3.5
170	3.5	1.7	1.2	2.2	3.3	3.6	3.6	1.4	2.1	2.9
180	3.5	2.9	1.6	2.9	2.2	2.5	3.0	2.8	3.2	4.0
190	1.0	3.1	2.4	1.3	2.0	4.1	2.9	3.4	3.1	2.5
200	1.8	2.8	2.1	3.2	2.5	3.7	3.6	3.3	1.8	3.3

- adhesion of all four veneer thicknesses of silver maple to particleboard substrate highly exceeds required value

- Technological Properties of Veneer from the Aspect of Surface Finish

- transparent paints and systems commonly used for finishing in furniture industry
- three-layer particleboard reversibly veneered 300 x 600 and 150 x 300 mm was used
- there exist two reasons for the use of final coating material; aesthetics and protection from the end use environment
- esthetics of the final product varies in many ways, depending upon the selection of the various topcoats available and upon how the final topcoat is handled

- Specimen were regularly subjected to laboratory tests related to the manufacturing's quality:
- **Determination the Local Thickness of the Paint**
- **Determination of the Paint Adhesion by Means of the Screen Method (Cross Hatch)**
- **Determination of Paint Hardness by Means of the Pencil Method**
- **Determination of the Resistance to Hot Steam**
- **Determination of the Resistance to a Burning Cigarette (Burn Resistance)**
- **Determination of the Resistance to Chemicals and Selected Consume Liquids (Spot Resistance)**

- Technological Properties of Veneer from the Aspect of Surface Finish

- three types of clean topcoats were used:

A. Nitrocellulose Lacquer C 1008

B. Synthetic Acid Hardening Lacquer S 1711

C. Nitrocellulose Lacquer Basic C 1026 + Synthetic Acid Hardening Lacquer S 1711

- during surface finishing the panel with veneer was sanded to “knock down” any fibers that have been raised by the application of the finishing material and for further the uniformity of the panel surface

RESULTS AND DISCUSSION

- the test results on glue penetration to the veneered area revealed no substantial glue penetration within the spread range of $140 - 170 \text{ g.m}^{-2}$ for all thicknesses
- the quality of veneers made of silver maple does not differ from the quality of commonly used veneers and thickness $0.6 - 0.7 \text{ mm}$ can be recommended for processing
- all finished types of paints provide acceptable adhesion degree independently of the type of paint used pointing to excellent or very good properties of silver maple veneers with regard to the paint adhesion
- glue spread $140 - 150 \text{ g.m}^{-2}$ was proposed for particleboard or MDF

CONCLUSIONS

- selected introduced woody species suggest good perspectives in the coming years and the future quality and volume of production may be secured providing systematic and intense tending of forest stands takes places
- silver maple is suitable for veneering of wood composites (particleboard, MDF) and it is fully recommended
- it is suitable for aesthetic application in the furniture industry either as a replacement for some commonly used woody species or as a woody species widening the assortment of woody species utilized in furniture industry







Thank you for your attention.

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