

Effect of negative factors on the use of oak and beech for decorative veneers

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ABSTRACT: The paper summarizes results of an institutional research aimed at the analysis of relationships between the quality of decorative veneers of oak and beech and negative factors decreasing the use of veneers. Effects of factors were assessed in the preparation, storage and protection of a raw material, treatment of logs before slicing and stay-log cutting and in the manufacture of veneers proper. Intensity of spraying was measured, protection of raw material during storage and regimes of hydrothermic preparation were assessed. Qualitative yield was determined in 386 logs of a diameter from 34 to 66 cm comparing four methods of cutting: half-round cutting and two-sided slicing with half-round cutting and stay-log cutting of a half-round log and a whole log. The quality of veneers is also affected by the relative position and quality of cutting tools. Results of the paper consist in conclusions and recommendations for the better and more complete use of oak and beech to obtain quality veneers. The paper sets conditions for storage and protection, raw material preparation and regimes of hydrothermic treatment. Based on the research results we recommend to cut logs of oak of 30 to 40 cm diameter from two opposite sides (two-sided slicing) with the subsequent cutting into two parts. Each of the parts is sliced separately to a residual board. It is suitable logs of oak of 40 to 66 cm diameter to be lengthwise trimmed from two or four faces and then cut into two parts. It is recommended logs of beech of 30 to 44 cm diameter to be stay-log cut without lengthwise division in the whole log and logs over 44 cm diameter to be stay-log cut when divided into two parts. The necessary precondition of a quality veneer with a smooth surface and uniform thickness is keeping the geometry of cutting tools. It is necessary to check regularly determined parameters of a knife and nose bar in relation to a bolt. The nose bar and knife have to be made from a suitable material not causing colouring.

Keywords: veneer; qualitative yield; cutting; half-round cutting; stay-log cutting; oak; beech

In the Czech Republic, oak and beech belong to woody species which are very often processed to decorative veneers. Veneers are a material obtained by cutting wood to thin sheets using slicing or peeling machines. At present, decorative veneers serve particularly to the surface finish of construction boards and panels intended for the manufacture of furniture, constructional joinery or other elements. There is an increasing lack of suitable veneer raw material for the manufacture of decorative veneers. The shortage is caused by the growing difference between sources and needs. Together with the increasing demand qualitative requirements for the raw material on the market also increase. The condition reflects directly to the price of raw materials and in connection with the fact also to the price of products – sliced veneers, matched veneers and sheathed large-area materials. The trend has to be directed to savings of deficit expensive logs and their more complete use through the increase in yield particularly of quality veneers utilizable for matched veneers intended for front surfaces of furniture or other elements. The aim should not be to achieve maximum yield of veneers as a whole but quality veneers in particular.

The quality of veneers is dependent on the interaction of more factors given by the structure of wood and wood defects. It is necessary to take into account the creation of early and late wood, width and colour of annual rings, the occurrence of resin canals, the size and frequency of pith rays, the size and position of cells and characteristic colouring of wood. Wood structure and the occurrence of defects particularly of knots determine the wear of peeling and slicing knives (NAGAI 1993). The smoothness of veneer surface and wood density affect the adhesion of a gluing mixture to constructional boards (CHARITONOVA, CHUBUKINA 1988).

To obtain quality veneers from the aspect of aesthetics and technology is dependent on the direction of cut. It is necessary to pay increased attention to determine the cut direction because it affects the price of veneers. With a properly carried out cut and correctly set cutting geometry of the knife and nose bar it is possible to obtain veneers of much higher quality from the same log than veneers obtained by an incorrect cut (BUTLER et al. 1989).

No less important is the way of raw material preparation, i.e. storage, protection and longitudinal cutting of

a log to blocks. Hydrothermic treatment of round timber, logs or flitches is also very important. Not only the method of hydrothermic treatment but also the regime proper which can significantly affect the quality of veneers are important (KRÁL 2000).

MATERIAL AND METHODS

The quality of decorative veneers of oak and beech was evaluated according to the appearance of a tight side. A facing veneer is decisive for the determination of quality of the whole flitch (veneer bundle). Technical requirements for the quality of veneers and matched veneers are given in the ČSN 49 2301 standard Veneers, Basic and common provisions the ČSN 49 2315 standard Decorative veneers and the ČSN 49 2320 standard Matched veneers and edges. Inner sheets of the flitch must show on average the quality of a facing veneer while a difference from the facing veneer quality must not be greater than one degree of quality. The mentioned standards include manufactured thickness of veneers with allowed deviations. The extent of defects according to the quality categorization of oak and beech veneers is determined in particular by:

- the number and size of knots and holes remaining after them,
- length of checks in relation to the width and length of a veneer sheet,
- the size and number of insect entrance holes in relation to the sheet area,
- the extent of colouring or (in beech) the size of a false heart in relation to the sheet area,

- the extent of sapwood in oak in relation to the sheet width,
- the extent of roughness (raised grain) around knots and curly grains or in relation to the sheet area,
- the height of waviness of the veneer sheet.

Abnormal colouring decreasing the veneer quality is very often caused by the insufficient treatment of a raw material during storage. Poor protection of the raw material causes the development of micro-organisms, fungi and moulds which then induce colouring of wood.

In analysing causes of the origin of long strips of colouring going from the block butt along fibres attention was aimed at the way of log storage. During the examination, the development of damage by micro-organisms, rot, fungi, moulds etc. was studied. Intensity of spraying given by the number and arrangement of nozzles of a spraying device was monitored and evaluated. It was necessary to determine the intensity of spraying of butt and lateral parts of logs. The facts were measured and monitored in a log yard focusing on species subject to damage. Actual consumption of water was measured in each of the yard branches. Nozzles were placed on poles 6 m apart.

With respect to the tree species, physical and mechanical properties and log diameter the following methods were analysed of longitudinal cutting to blocks and veneer cutting:

1. Half-round cutting (Fig. 1)
2. Two-sized slicing with half-round cutting (Fig. 2)
3. Stay-log cutting of the whole log (Fig. 3)
4. Stay-log cutting of the half-round log (Fig. 4).

To determine a qualitative yield 386 logs of a mean diameter from 34 to 66 cm with a 2 cm interval was examined according to particular methods of processing and species. In each of the logs, parameters of processing the block were measured and checked (height, width, length before and after longitudinal cutting), the number of whole qualitatively suitable veneer sheets from the whole block or its particular parts, the area and volume of these veneers, the volume and proportion of a rest and residual board. Qualitative yield was then assessed of wet undried veneers in selected methods of longitudinal cutting, slicing and stay-log cutting of veneers and the yield of dry unadjusted veneers in particular species in total from the log volume.

The hydrothermic treatment was carried out by steam treatment in steaming pits where steam was pumped inwards directly through a warming conduit. In dependence on the environment temperature, log diameter and species temperatures were regulated in the steaming pit based on the determined values of temperature in relation to time. The environment temperature was scanned by a sensor placed on another side wall of the steaming pit. For direct steaming of beech, a regime was used with heating to 60°C for 8 hours, next heating to 70°C for further 7 hours and heating to 80°C next 6 hours. Heating to a temperature of 90°C for further 32 hours. Equalization steaming and cooling for 7 hours. The total time of steaming reached 71 hours.

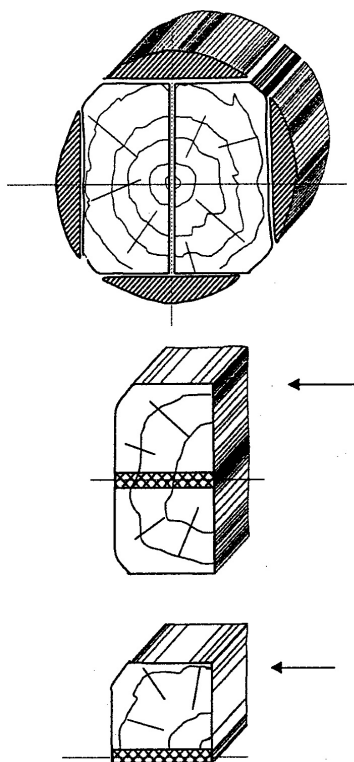


Fig. 1. Half-round cutting

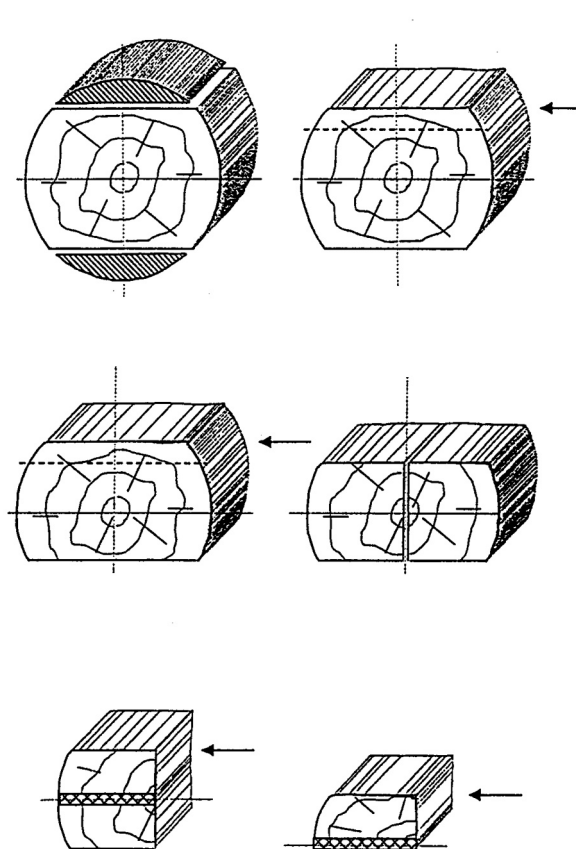


Fig. 2. Two-sized slicing with half-round cutting

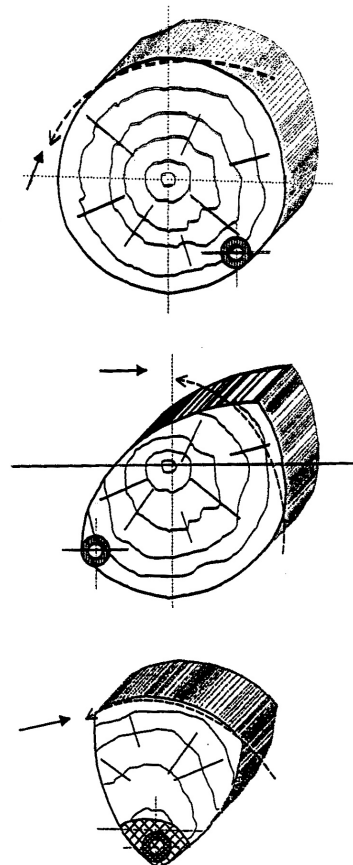


Fig. 3. Stay-log cutting of the whole log

Direct steaming of oak:

- heating to a temperature of 50°C for 9 hours,
- heating to a temperature of 65°C for next 8 hours,
- further heating to a temperature of 80°C for next 8 hours,
- further heating to a temperature of 90°C for 34 hours,
- equalization steaming, cooling to 20°C for 16 hours,
- the total time of steaming amounted to 75 hours.

To produce quality decorative veneers of uniform thickness, with smooth surface, without transparency, torn up fibres etc. it is important to observe optimum temperatures during processing. The temperature of blocks before and after slicing and stay-log cutting was measured and checked by a DT 150 digital thermometer which is designed for the measurement of absolute temperatures from –50°C to 150°C. Resolution 0.1°C. Measurements were carried out by a probe 6 and 12 cm long.

To measure cutting geometry (clearance angle, angle of cutting edge β , horizontal gap h_1 and vertical gap between the knife and nose bar h_2 and the distance of knife edge from the axis of spindles) a special set AS-30 was used which includes an instrument to measure clearance angle α , a height gauge and a device for measuring the distance between the knife and nose bar.

For values of the qualitative yield of 386 blocks under study sample statistics were determined (sample mean, standard error, variation amplitude, sample variance,

sample standard deviation, variation coefficient, median, modus, significance level, maximum and minimum value). Sample characteristics were determined for selected

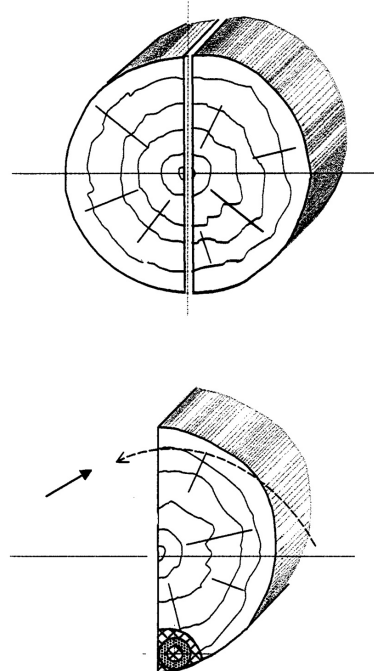


Fig. 4. Stay-log cutting of the half-round log

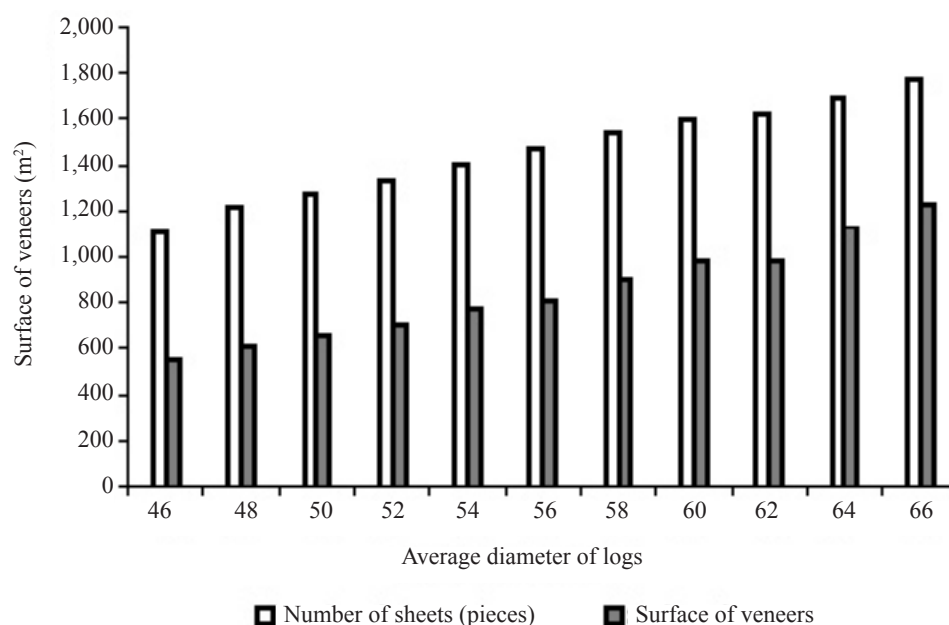


Fig. 5. Number of sheets and the area of veneers at half-round cutting (oak)

methods of veneer cutting and stay-log cutting according to species and diameter.

RESULTS AND DISCUSSION

Based on measurements carried out in the log yard the mean consumption of water in particular branches ranged between 162.3 and 169.5 litres. It was found that the distance of spraying was 3.8–4.2 m and with respect to the fact that the width of beech and oak log dump amounted to 11.3 m, the middle part of the landing was not protected by spraying but by fine mist only.

With the area of the yard 1,153 m² the total consumption of water per day amounted to 82.45 l/m². Prescribed values range from 72 to 144 l/m² per day for the period from April to October to 435–648 l/m² in July and August. These unfavourable values were found in the first year of investigation and, therefore, adaptation of wet protection was carried out.

The total period of hydrothermic treatment at steaming beech including equalization reached 71 hours for logs over 40 cm diameter and outdoor temperature over +5°C. Better results were achieved by extending the period of steaming proper at 85°C to 80 hours. The total period of steaming oak reached 75 hours. A temperature at steaming proper was decreased from 90 to 85°C and increased at equalization additional steaming from 20 to 50°C. The total period of steaming remained 75 hours.

Parameters of processed blocks, the number of qualitatively satisfactory undried veneer sheets from particular parts of blocks, the volume of slicing rests and residual boards were determined before and behind veneer lathes and veneer-slicing machines. In selected methods of longitudinal cutting, slicing and stay-log cutting measured values of the total number of veneer sheets were evaluated by descriptive statistics. In examined 386 logs of 34 to 66 cm diameter and length 2.6 m, following sum-

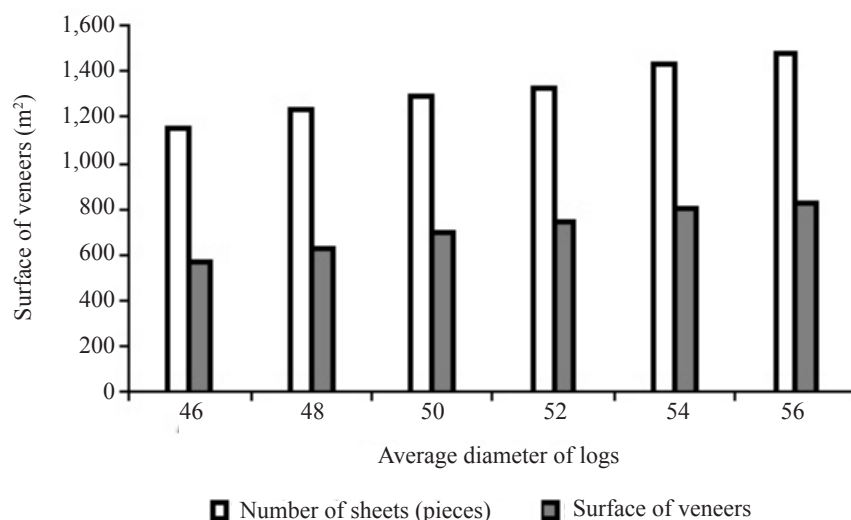


Fig. 6. Number of sheets and the area of veneers at half-round cutting (beech)

Table 1. Statistical evaluation of veneer sheets at half-round cutting (oak)

Statistical parameter	Average diameter of logs (cm)										
	46	48	50	52	54	56	58	60	62	64	66
m	1,111	1,220	1,276	1,336	1,399	1,470	1,538	1,602	1,625	1,695	1,779
$x_{\min}$	1,060	1,180	1,200	1,301	1,335	1,380	1,500	1,520	1,440	1,640	1,720
$x_{\max}$	1,160	1,301	1,340	1,380	1,460	1,500	1,560	1,640	1,680	1,760	1,820
s^2	236.58	181.58	374.74	164.21	445.00	215.79	99.67	327.89	861.78	235.53	194.47
s	15.38	13.48	19.36	12.81	21.10	14.69	9.98	18.11	29.36	15.35	13.95
$V(\%)$	2.78	2.21	3.03	1.92	3.02	1.99	1.29	2.26	3.61	1.81	1.57
n	10	10	10	10	10	10	10	10	10	10	10

Table 2. Statistical evaluation of veneer sheets at half-round cutting (beech)

Statistical parameter	Average diameter of logs (cm)					
	46	48	50	52	54	56
m	1,148	1,228	1,295	1,326	1,430	1,490
$x_{\max}$	1,060	1,160	1,202	1,150	1,380	1,390
$x_{\min}$	1,240	1,300	1,404	1,460	1,520	1,520
s^2	497.63	395.46	832.89	2,006.3	401.25	284.25
s	22.31	19.88	28.86	44.79	20.03	16.86
$V(\%)$	3.89	3.24	4.46	6.76	2.80	2.59
n	10	10	10	10	10	10

mary values were determined according to particular methods and species:

1. Half-round cutting (oak veneer, thickness 0.6 mm)

Results of the study of oak according to particular size groups expressed by the number of qualitatively satisfactory whole sheets and by the area of veneers obtained at half-round cutting are given in Fig. 5, statistical analysis of data is part of Table 1.

Average yield in oak at half-round cutting was reached in the interval from 75.1 to 80.0% and the proportion of slicing rests amounted to 4.0 to 5.63%.

2. Half-round cutting (beech veneer, thickness 0.6 mm)

Results of the study of beech according to particular size groups expressed by the number of qualitatively satisfactory whole sheets and by the area of veneers obtained at half-round cutting are given in Fig. 6, statistical analysis of data is part of Table 2.

Average yield in beech at half-round cutting was reached in the interval from 78.8 to 80.4% and the proportion of slicing rests amounted to 5.32 to 7.66%.

3. Two-sided slicing with half-round cutting (oak veneer, thickness 0.6 mm)

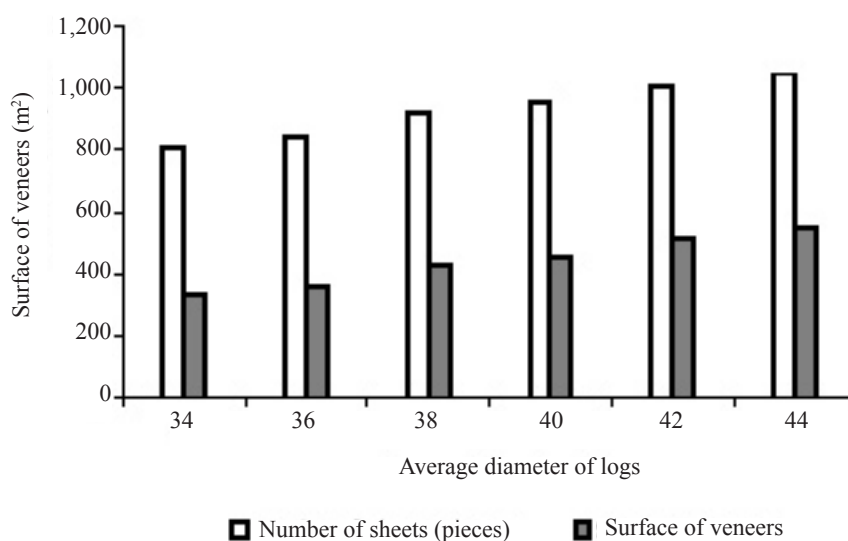


Fig. 7. Number of sheets and the area of veneers at two-sided slicing with half-round cutting (oak)

Table 3. Statistical evaluation of veneer sheets at two-sided slicing with half-round cutting (oak)

Statistical parameter	Average diameter of logs (cm)					
	34	36	38	40	42	44
m	803	838	919	955	1,004	1,044
$x_{\min}$	720	780	820	860	940	920
$x_{\max}$	860	899	990	1,025	1,090	1,120
s^2	240.53	288.42	449.5	291.78	280.00	708.95
s	15.50	15.98	21.2	17.08	16.73	26.62
$V(\%)$	4.59	4.79	5.41	4.15	3.86	5.96
n	10	10	10	10	10	10

Table 4. Statistical evaluation of veneer sheets at the stay-log cutting of a whole log (beech)

Statistical parameter	Average diameter of logs (cm)					
	38	40	42	44	46	48
m	595	596	663	698	709	748
$x_{\min}$	540	520	602	661	680	720
$x_{\max}$	660	661	703	742	740	822
s^2	1,561.1	1,756.6	806.94	622.50	565.56	929.16
s	39.51	41.91	28.41	24.95	23.78	30.48
$V(\%)$	6.64	7.07	4.29	3.59	3.35	4.08
n	10	10	10	10	10	10

Results of the study of oak according to particular size groups expressed by the number of qualitatively satisfactory whole sheets and by the area of veneers obtained at two-sided slicing with half-round cutting are given in Fig. 7. Statistical analysis of data is part of Table 3.

Average yield in beech at two-sided slicing with half-round cutting was reached in the range from 82.1 to 86.0% and the proportion of slicing rests amounted to 6.2 to 8.7%.

4. Stay-log cutting of the whole log (beech veneer, thickness 0.6 mm)

Results of the study of beech according to particular size groups expressed by the number of qualitatively satisfactory whole sheets and by the area of veneers obtained at the stay-log cutting of a whole log are given in Fig. 8. Statistical analysis of data is part of Table 4.

Average yield in beech at the stay-log cutting of a whole log was achieved in the range from 79.4 to 85.0% and the proportion of slicing rests amounted to 6.9 to 11.3%.

5. Stay-log cutting of half-round logs (beech veneer, thickness 0.6 mm)

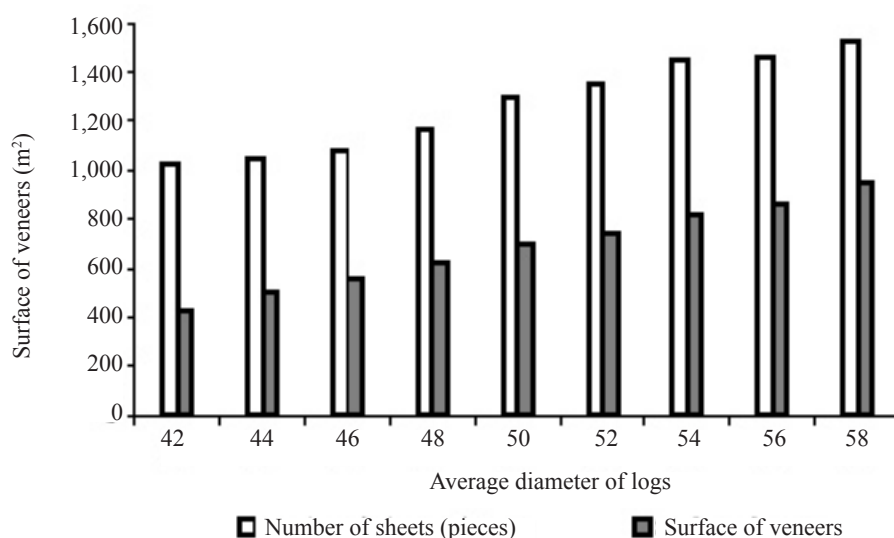


Fig. 8. Number of sheets and the area of veneers at the stay-log cutting of a whole log (beech)

Table 5. Statistical evaluation of veneer sheets at the stay-log cutting of a half-round log (beech)

Statistical parameter	Average diameter of logs (cm)								
	42	44	46	48	50	52	54	56	58
m	1,020	1,050	1,076	1,168	1,302	1,352	1,446	1,463	1,523
$x_{\min}$	960	880	842	862	1,142	1,142	1,208	1,246	1,321
$x_{\max}$	1,120	1,160	1,203	1,405	1,425	1,443	1,582	1,598	1,624
s^2	653.88	1,493.3	3,711.6	3,520.0	2,146.3	2,098.9	2,896.8	2,550.7	1,598.7
s	25.57	38.64	60.92	59.33	46.3	45.8	53.81	50.51	39.98
$V(\%)$	5.02	7.35	11.32	10.16	7.12	6.78	7.44	6.91	5.24
n	10	10	10	10	10	10	10	10	10

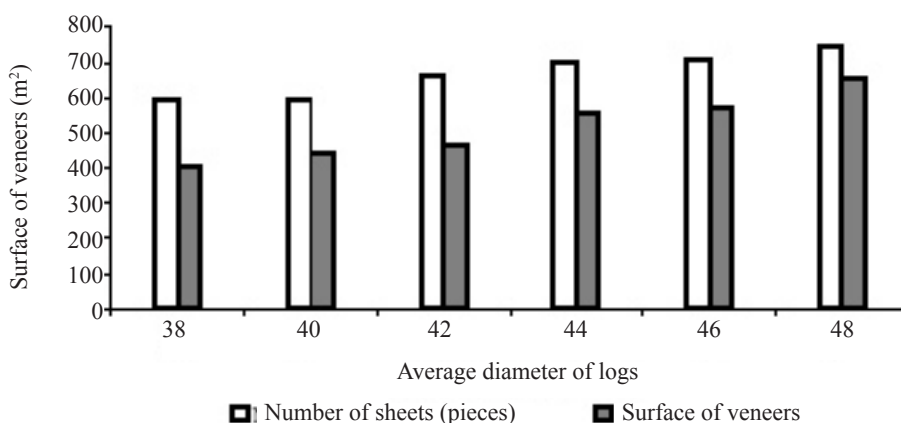


Fig. 9. Number of sheets and the area of veneers at the stay-log cutting of a half-round log (beech)

Results of the study of beech according to particular size groups expressed by the number of qualitatively satisfactory whole sheets and by the area of veneers obtained at stay-log cutting of half-round logs are given in Fig. 9. Statistical analysis of data is part of Table 5.

Average yield in beech at stay-log cutting of half-round logs was reached in the range from 75.9 to 83.3% and the proportion of slicing rests amounted to 9.1 to 17.1%.

Higher yield was achieved at the stay-log cutting of whole logs. Lower yield at the stay-log cutting of half-round logs results from the larger proportion of two rests which remain as waste after removal from the jaws of a veneer lathe.

CONCLUSION

Generally, it is possible to say that the best results as for yield were obtained in smaller diameters (34–44 cm) at two-sided slicing with half-round cutting. In larger diameters (46–66 cm) better results were achieved at half-round cutting.

At stay-log cutting, yield is lower by 1.4–6.2% due to the higher proportion of rest.

In evaluating the qualitative yield according to species from the registration of logs to unadjusted sorting of bundles of dry veneers the yield of oak veneer ranged from 58.4 to 60.3%. In beech veneer of 0.6 mm thickness, yield ranged between 46.8 and 51.6%. Based on the

statistical evaluation of the number of produced veneer sheets according to particular diameters from 34 to 66 cm with 2-cm interval it is possible to state that it is a case of sampling with low and medium variability.

Measurement of the block temperature was carried out after removal from a pit after hydrothermic treatment and before a slicing machine and a veneer lathe. After the hydrothermic treatment, the temperature of blocks ranged from 60.4 to 70.8°C and one hour after the removal from a pit 51.7–55.2°C, before the slicing machine and veneer lathe 38.8–50.2°C. At a temperature over 70°C, problems occurred concerning enfolding the veneer sheets and at a temperature below 40°C torn up fibres and transparency occurred.

These problems did not occur at slicing cooled blocks below 30°C.

In assessing parameters of cutting geometry, optimum cutting conditions were determined for slicing and stay-log cutting. For vertical slicing, it is possible to recommend the following parameters:

- clearance angle (α) 1–2°
- angle of cutting edge (β) 17°–18°30'
- angle of the nose bar cutting edge (β_1) 60–70°
- nose bar cutting edge radius (r_{β_1}) 0.5 mm
- height gap between the knife and the nose bar – vertical (h_2) 0.5–1.5 mm
- thickness gap (h_1) 0.4–0.8 mm.

For stay-log cutting, it is possible to recommend following parameters:

- clearance angle is dependent on the diameter size
- for log diameter 40 cm and more $1^{\circ}30' - 2^{\circ}30'$
- for log diameter 10 cm $0^{\circ} - 0^{\circ}30'$
- for species with wood density $< 550 \text{ kg/m}^3$ $2^{\circ}30' - 0^{\circ}30'$
- for species with wood density $> 550 \text{ kg/m}^3$ $2 - 0^{\circ}$
- angle of cutting edge $17^{\circ}30' - 19^{\circ}$
- vertical gap between the knife edge and the nose bar edge (h_2) 1 mm
- horizontal gap between the knife edge and the nose bar (h_1) 0.4–1.0 mm.

In measuring and assessing particular methods of slicing and stay-log cutting, dark, blue-grey to blue-black stains occurred irregularly on the surface of veneer sheets. Wood coming in contact with iron or steel forms on its surface colouring which becomes worse with the time of contact. The most frequent occurrence of such a colouring appeared in oak or sapwood of maple. In oak, it is caused by the high content of tannins, in maple by light colouring.

This drawback significantly impairing the quality of veneers can be prevented by keeping the knife and nose bar as clean as possible, by heating the knife and nose bar and thus preventing condensation or guarding the knife and nose bar. In the last-mentioned method, cutting edge is uncovered only. Another method is using stainless steel for a nose bar and knife, using double bevel of a knife which means that the clearance face of a cutting or peeling knife cannot chafe against a block. The drawback can be also prevented using a grater clearance angle which means that the clearance face is not in contact with a cant. It is also possible to use the smaller pressure of a nose bar.

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Received for publication February 13, 2003

Accepted after corrections March 24, 2003

Vliv negativních faktorů na využití dubu a buku na okrasné dýhy

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ABSTRAKT: Článek shrnuje práce institucionálního výzkumu zaměřeného mj. na analýzu vztahu kvality okrasných dýh dubu a buku vzhledem k negativním faktorům, které snižují využitelnost dýh. Bylo hodnoceno působení činitelů při přípravě, skladování a ochraně suroviny, úpravě výřezů před krájením a excentrickým loupáním a při vlastní výrobě dýh. Byla měřena intenzita postřiku, ochrana suroviny při skladování, hodnoceny režimy hydrotermické přípravy. Byla zjišťována kvalitativní výtěž u 386 kusů výřezů o tloušťce od 34 do 66 cm porovnáním dvou způsobů krájení (krájení na poloviny a dvoustranné krájení s dělením na poloviny) a excentrického loupání polovičního a celého výřezu. Kvalita dýh je také ovlivněna vzájemnou polohou a kvalitou řezných nástrojů. Výsledkem práce jsou závěry a doporučení pro lepší a dokonalejší využití dubu a buku na získání kvalitních dýh. V příspěvku jsou stanoveny podmínky skladování a ochrany, přípravy suroviny a režimy hydrotermické úpravy. Výřezy dubu o průměru 30–40 cm na základě výsledků doporučujeme krájet ze dvou protilehlých stran (dvoustranné krájení) s následným dělením na poloviny. Každá polovina je dokrájena samostatně na zbytkovou desku. Výřezy dubu o průměru 40 až 66 cm je vhodné podélně ořezat ze dvou nebo čtyř stran a následně dělit na poloviny. Výřezy buku o průměru 30–44 cm doporučujeme excentricky loupat bez podélného rozdělení v celém výřezu a výřezy nad průměr 44 cm excentricky loupat dělené na

poloviny. Dodržování geometrie řezných nástrojů je nezbytným předpokladem kvalitní dýhy s hladkým povrchem a stejnoměrnou tloušťkou. Stanovené parametry nože a tlačné lišty ve vztahu k bloku je nutné pravidelně kontrolovat. Tlačná lišta a nůž musí být z vhodného materiálu, který nezpůsobuje zbarvení.

Klíčová slova: dýha; kvalitativní výtěž; krájení; dělení na poloviny; excentrické loupání; dub; buk

Dub a buk patří v naší republice k dřevinám, které jsou velmi často zpracovávány na okrasné dýhy. Získání esteticky a technicky kvalitních dých závisí na směru řezu. Určení směru řezu je nutné věnovat zvýšenou pozornost, neboť se rozhoduje o ceně dých. Při správně vedeném řezu a vhodně nastavené řezné geometrii nože a tlačné lišty je možné získat z téhož výřezu dýhy mnohem jakostnější, než jsou dýhy získané nesprávným řezem. Velmi důležitý je způsob přípravy suroviny – skladování, ochrana a podélné dělení výřezu na bloky a hydrotermická úprava kulatiny nebo výřezů. Důležitý není pouze způsob hydrotermické úpravy, ale také vlastní režim, který může významným způsobem ovlivnit kvalitu dých.

Kvalita okrasných dých dubu a buku byla hodnocena podle vzhledu pravé strany. Při analýze byl zjišťován vývoj poškození mikroorganismy, hnilobou, houbami, plísněmi apod. Byla sledována a vyhodnocována intenzita postřiku, daná množstvím a rozmístěním trysek postřikovacího zařízení. Byly analyzovány dva způsoby krájení a dva způsoby excentrického loupání dých. Pro hodnocení kvalitativní výtěže bylo sledováno 386 ks výřezů střední tloušťky od 34 do 66 cm s odstupňováním po 2 cm podle jednotlivých způsobů zpracování a dřeviny. Hydrotermická úprava probíhala přímým pařením v pařících jámách, do kterých byla pára vháněna přímo ohřívacím potrubím. V závislosti na teplotě okolního prostředí, průměru výřezů a druhu dřeviny byla regulována teplota prostředí v pařici jámě na základě stanovených hodnot teploty v závislosti na čase. Teplota bloků před a po krájení a excentrickém loupání byla měřena a kontrolována digitálním teploměrem DT 150. K měření řezné geometrie (úhlu hřbetu α , úhlu ostří β , horizontální mezery h_1 a vertikální mezery mezi nožem a tlačnou lištou h_2

a vzdálenosti ostří nože od osy vřeten) bylo použito speciální soupravy AS-30.

Při ploše skladu 1 153 m² činila celková spotřeba vody za den 82,45 l/m². Předepsané hodnoty se pohybují od 72–144 l/m² za den pro období od dubna do října až po 435–648 l/m² v červenci a srpnu. Tyto nepříznivé hodnoty byly zjištěny v prvním roce zkoumání a byla provedena úprava vlhké ochrany. Celková doba hydrotermické úpravy při paření buku včetně egalizace dosahovala 71 hodin. Lepších výsledků bylo dosaženo při prodloužení doby vlastního paření. Celková doba paření dubu dosahovala délky 75 hodin. Byla snížena teplota při vlastním paření a zvýšena teplota při egalizačním dopařování. Měření teploty bloků bylo prováděno po vyjmutí z jámy po provedené hydrotermické úpravě a před krájecím a loupacím strojem. Po hydrotermické úpravě se teploty bloků pohybovaly v rozmezí 60,4–70,8 °C, jednu hodinu po vyjmutí z jámy 51,7–55,2 °C, před loupacím a krájecím strojem 38,8–50,2 °C. Při teplotě nad 70 °C vznikaly problémy se zavinováním dýhových listů a při teplotě pod 40 °C se vyskytovala vytrhaná vlákna a transparentnost. Tyto problémy nevznikly při krájení vychladlých bloků buku pod 30 °C.

Nejlepších výsledků ve výtěži bylo dosaženo u menších průměrů (34–44 cm) při dvoustranném krájení s dělením na poloviny. U větších průměrů (46–66 cm) bylo dosaženo lepších výsledků při krájení na poloviny. Při excentrickém loupání je výtěž nižší o 1,4 až 6,2 % z důvodu vyššího podílu zbytku. Při vyhodnocení kvalitativní výtěže podle dřevin od příjmu kulatiny až po neadjustované vytříděné svazky suchých dých se výtěž u dubové dýhy 0,6 mm pohybovala v rozmezí 58,4 až 60,3 %. U bukové dýhy tloušťky 0,6 mm byla získána výtěž v rozmezí 46,8–51,6 %.

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