Effect of high pressurised water on wood surfaces

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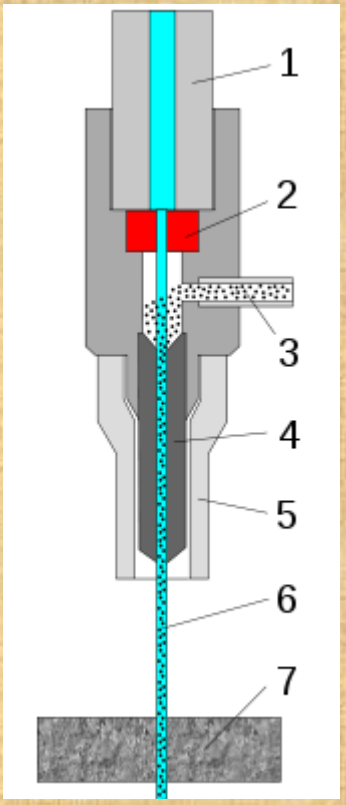
Utilization of high pressurised water in wood industry

Cutting of wood with water jet

- Gerencsér K. - Bejó L.(2006): Investigations related to water jet cutting of solid wood



Utilization of high pressurised water in wood industry

Debarking of wood

- Holveck Joseph E, Rockwood Arthur G (1951) Hydraulic-type log debarker having centripetally directed jets mounted in circumferential groups radially adjustable for different size logs - US2578804 A
- http://www.falch.com/

Utilization of high pressurised water in wood industry

Cleaning of wood surfaces

- Ganne-Chédeville C. (2010): Merkblatt zur Reinigung von unbehandelten Holzfassaden mit dem Hochdruckreiniger

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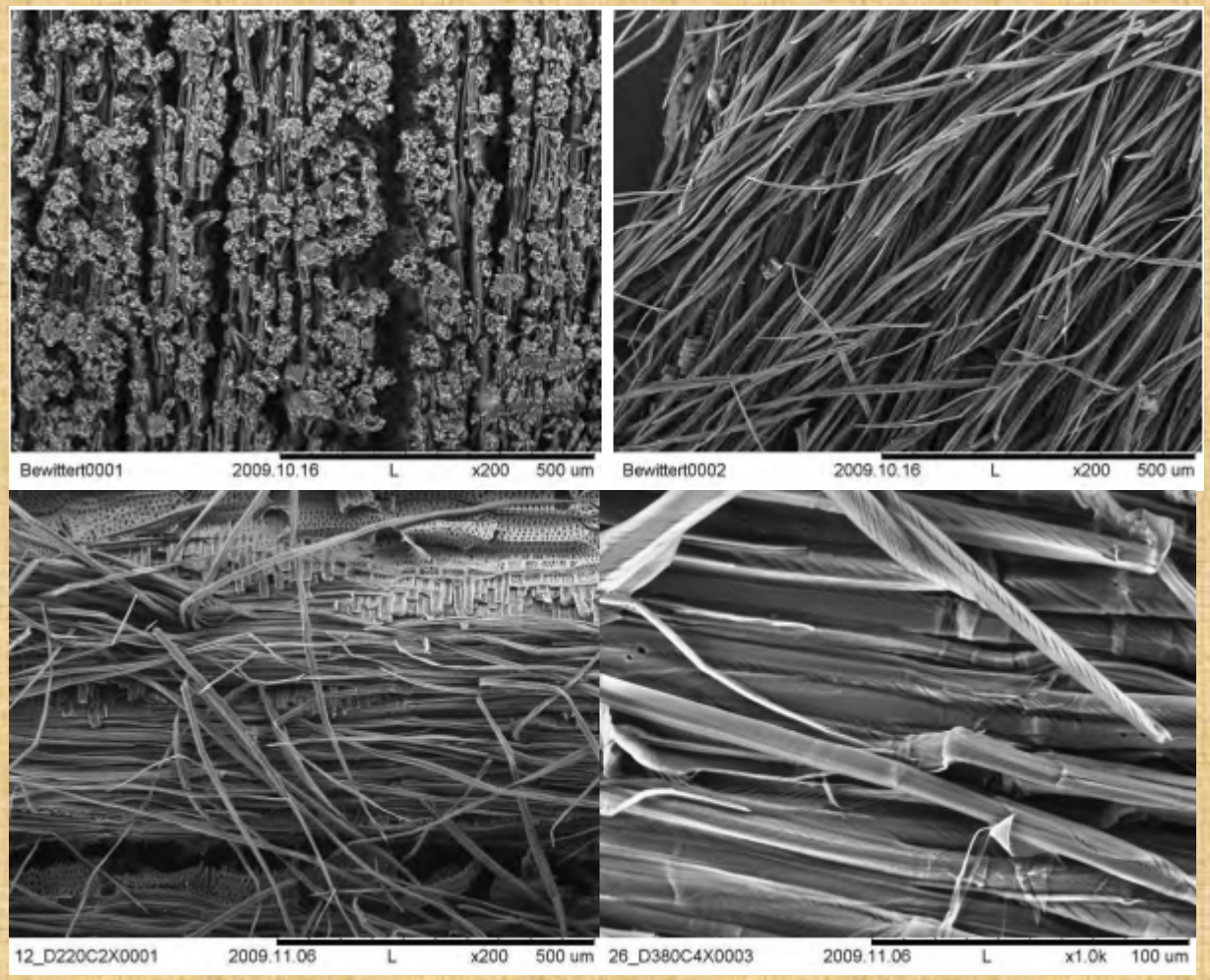


Aims of the research

- To analyse the abrasion effect of high pressure water jet on different wood species
- To prove the protecting effectiveness of different surface finishing materials against the abrasion
- To show the importance of treatment’s time on the abrasion process

Wood species and surface treatments

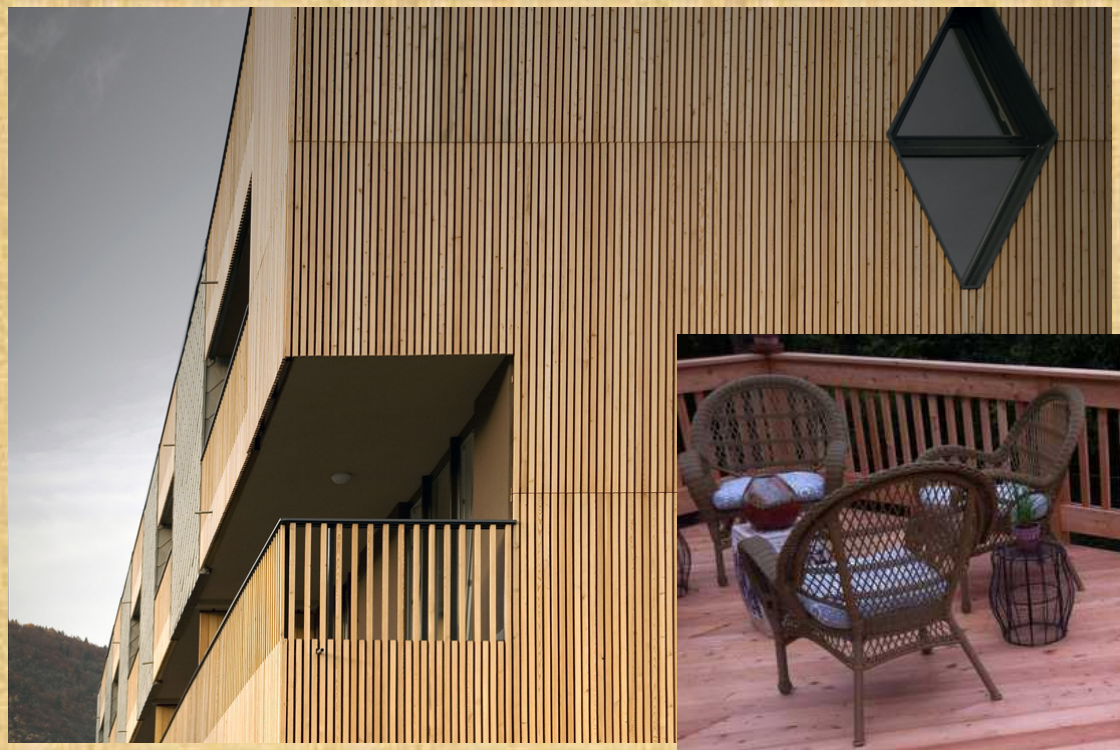
3 wood species:

- larch (*Larix decidua*)
- black locust (*Robinia pseudoacacia*)
- kapur (*Dryobalanops spp*.)

surface finishing materials:

- Untreated wood
- Sadolin outdoor wood deck glazing
- Woodex wood oil (drying oil)

Larch outdoor products

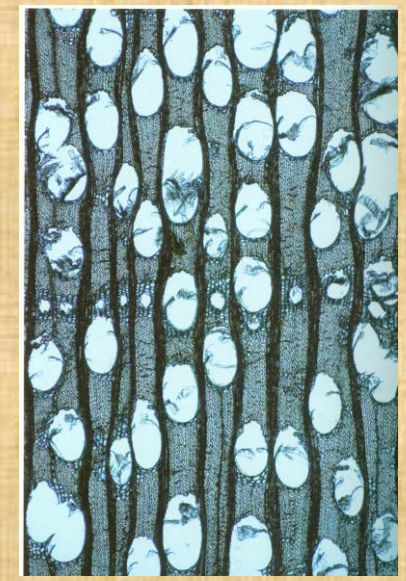


Black locust outdoor products

Kapur outdoor products

Basic properties of investigated species

	Larch	Black locust	Kapur
Density (MC=12%)	590 kg/m^3	770 kg/m^3	785 kg/m^3
Hardness (HBM side)	19 MPa	48 MPa	48 MPa



Methods

Pressure outlet: 100 bar
Distance: 10 centimetres
Angle: 70 degrees

treatment time (larch – for 0.5, 1 and 2 minutes, black locust and kapur: for 2, 3 and 4 minutes

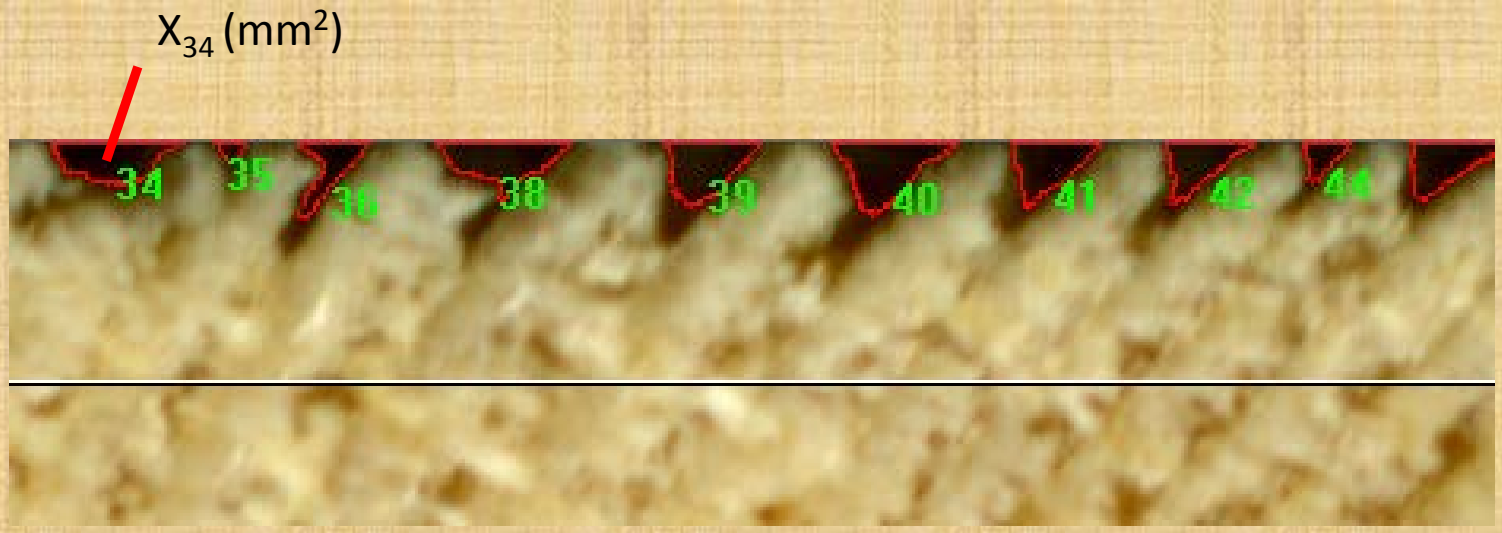

black locust


larch

Larch 2 minutes treatment

Black locust 4 minutes treatment

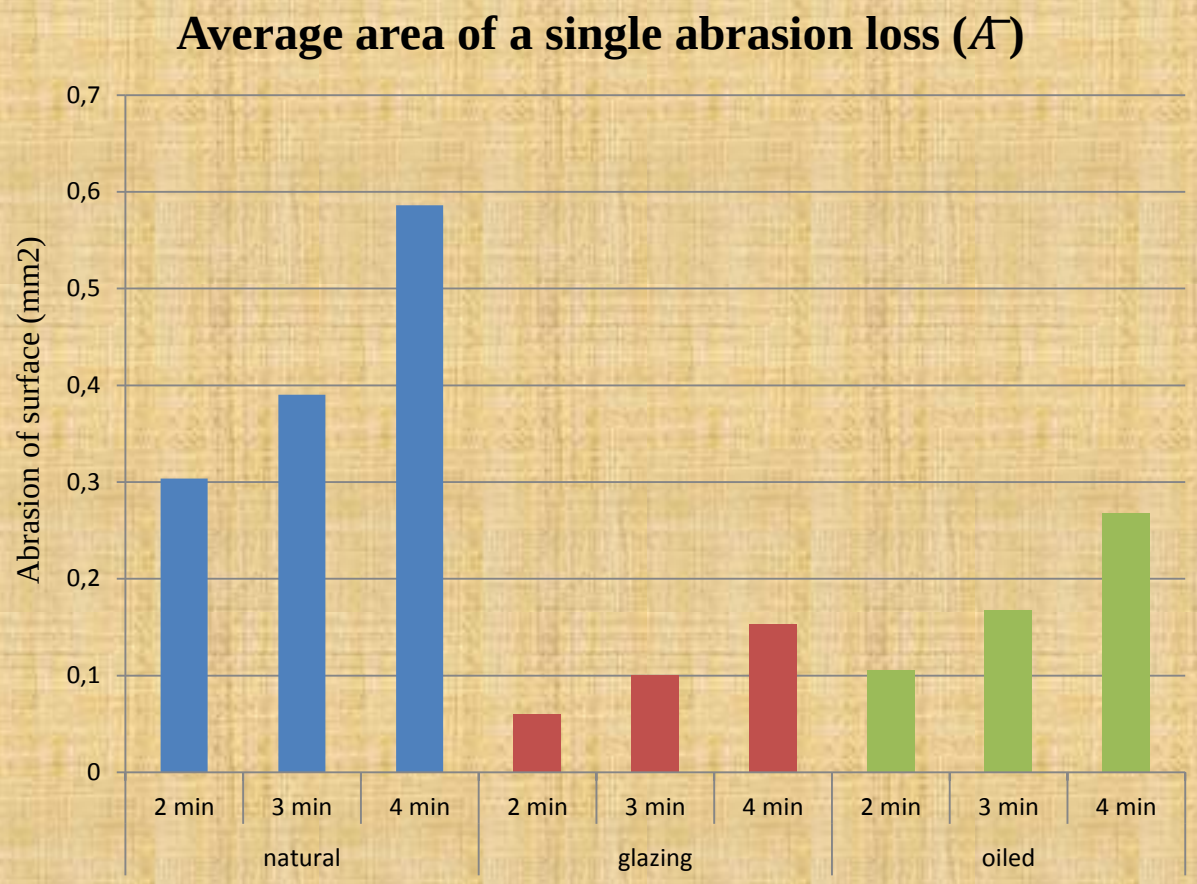
Measurement



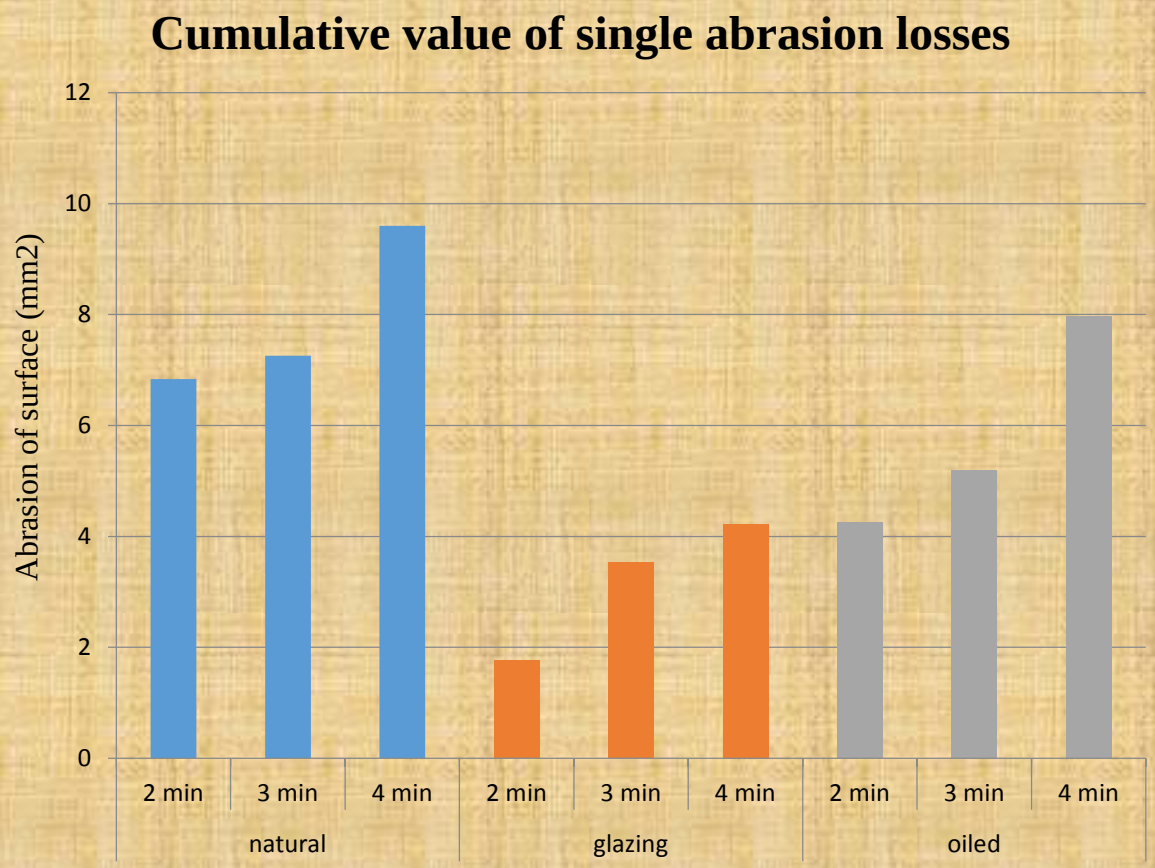
$$\bar{A} = \frac{x_1 + x_2 + \ldots + x_n}{n}$$

$$\sum_{i=1}^{n} x_n = x_1 + x_2 + \ldots + x_n$$

Abrasion of surface for larch

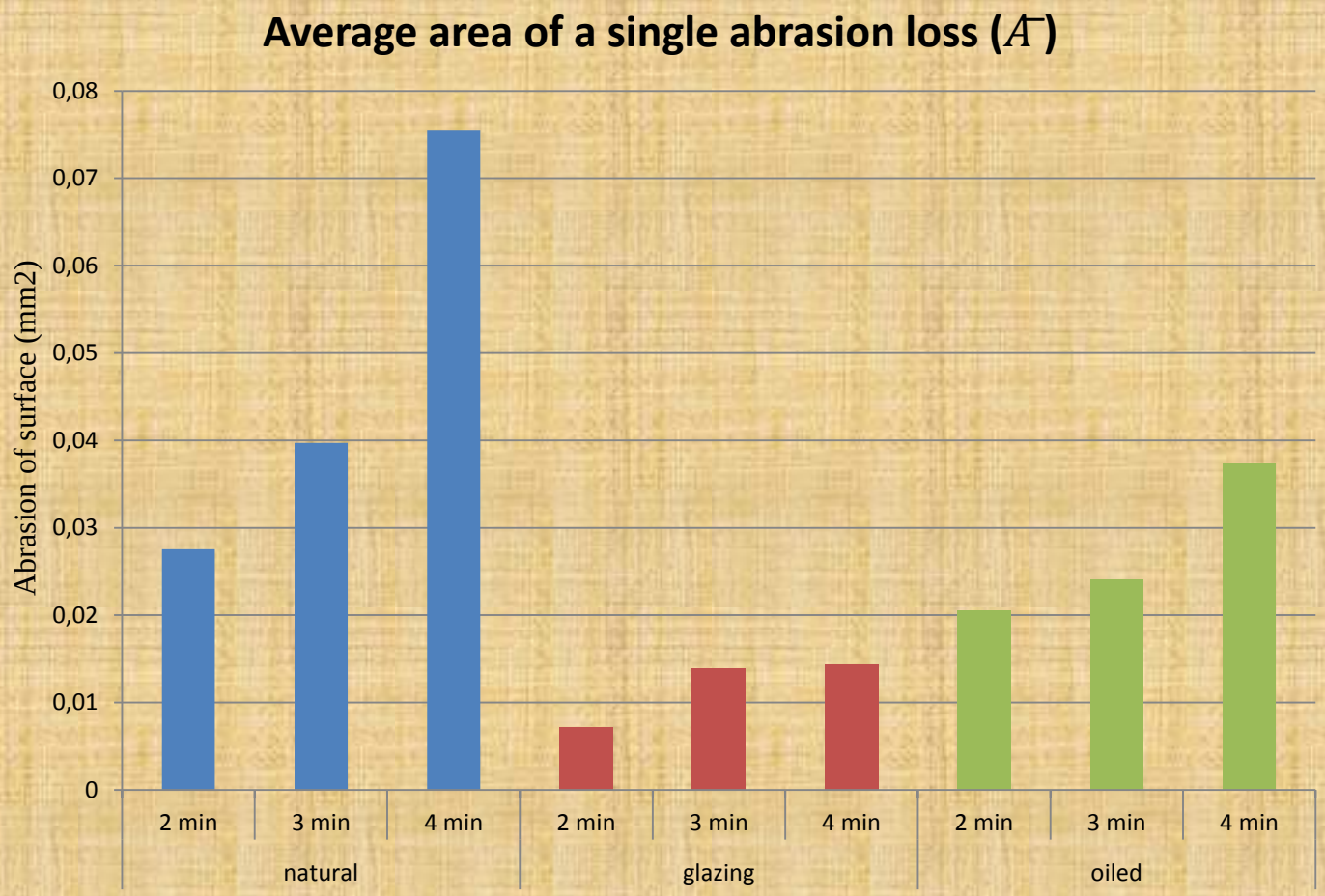


Abrasion of surface for larch

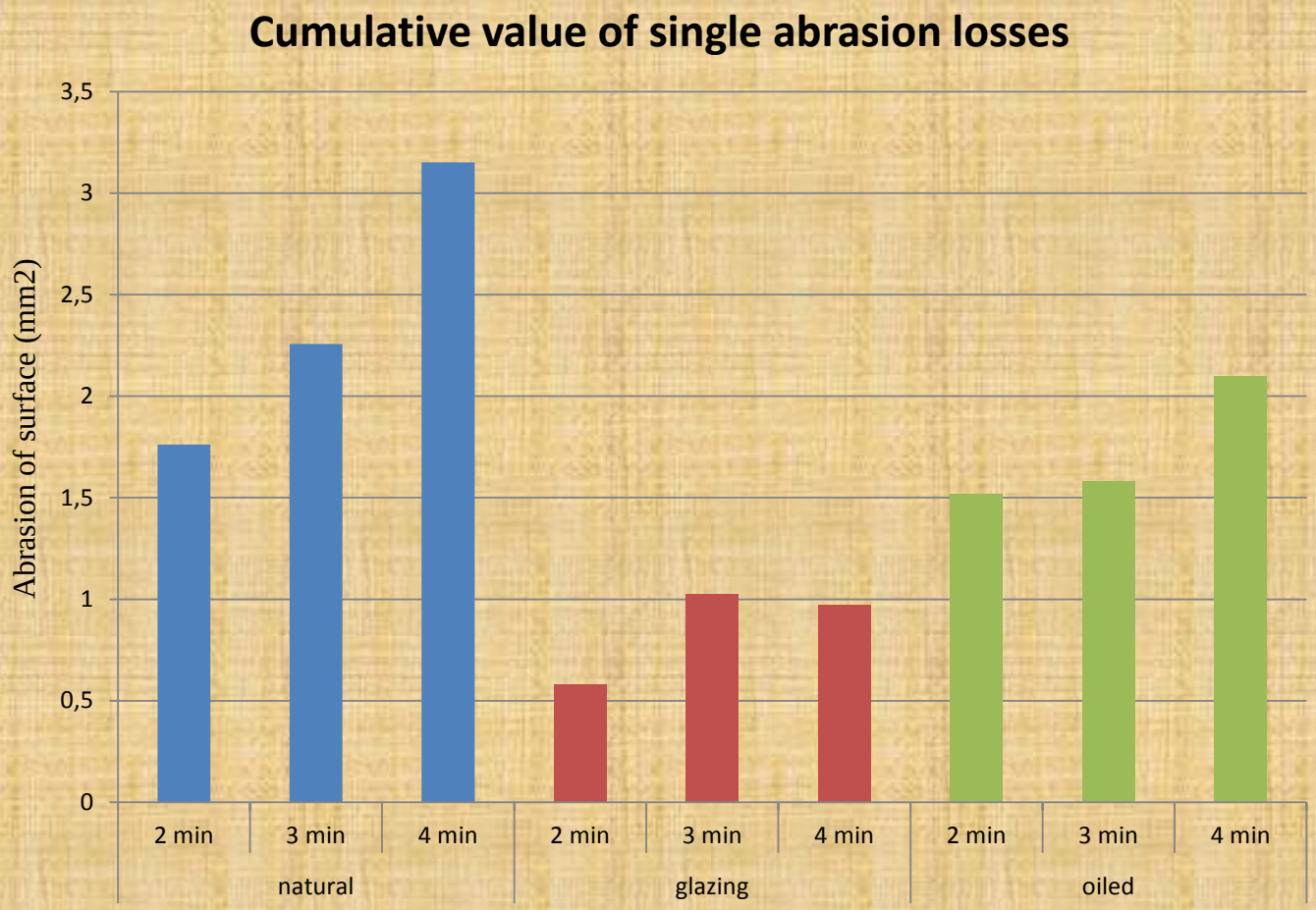


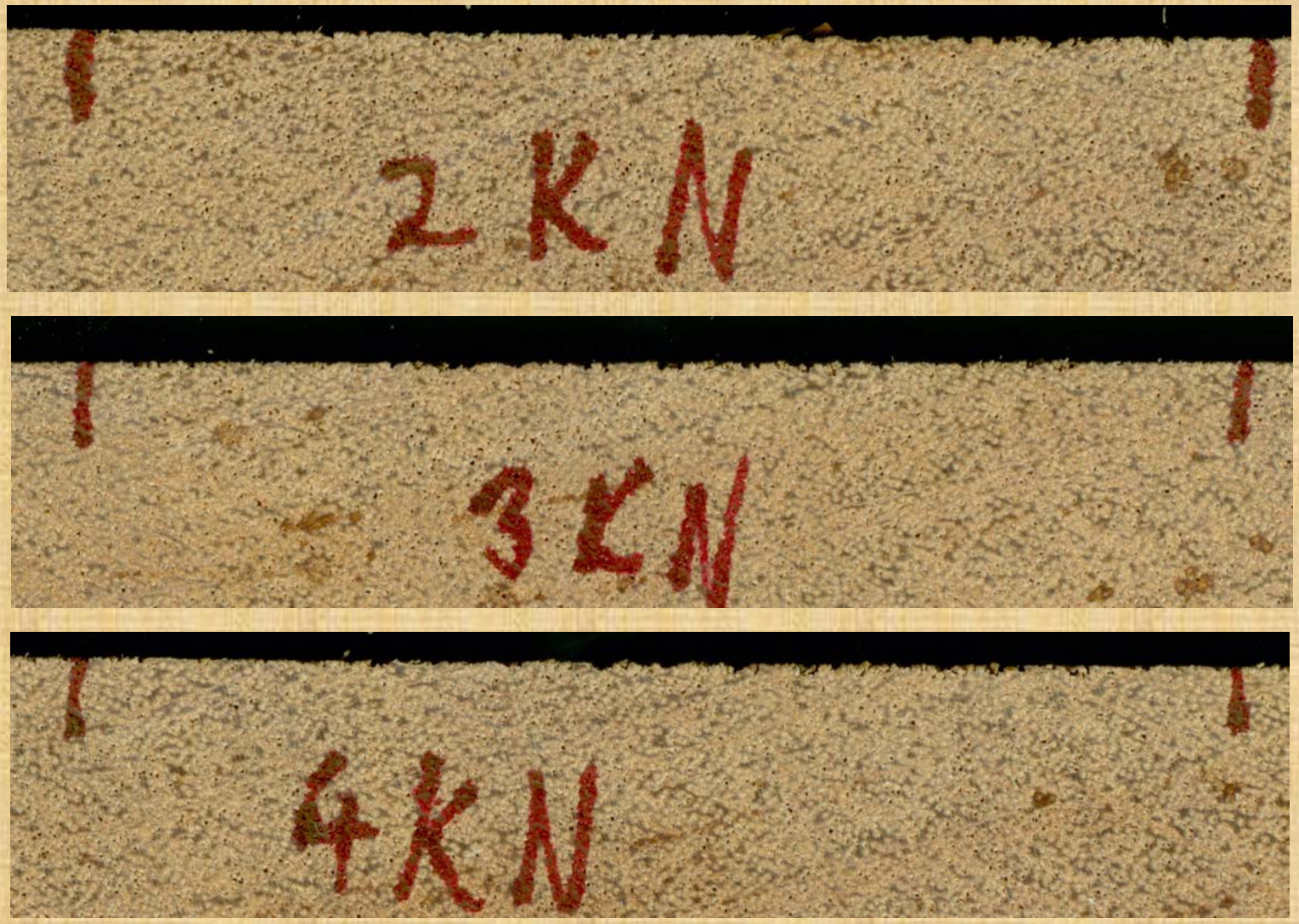

0,5 kN
1 kN
2 kN

Abrasion of surface for kapur

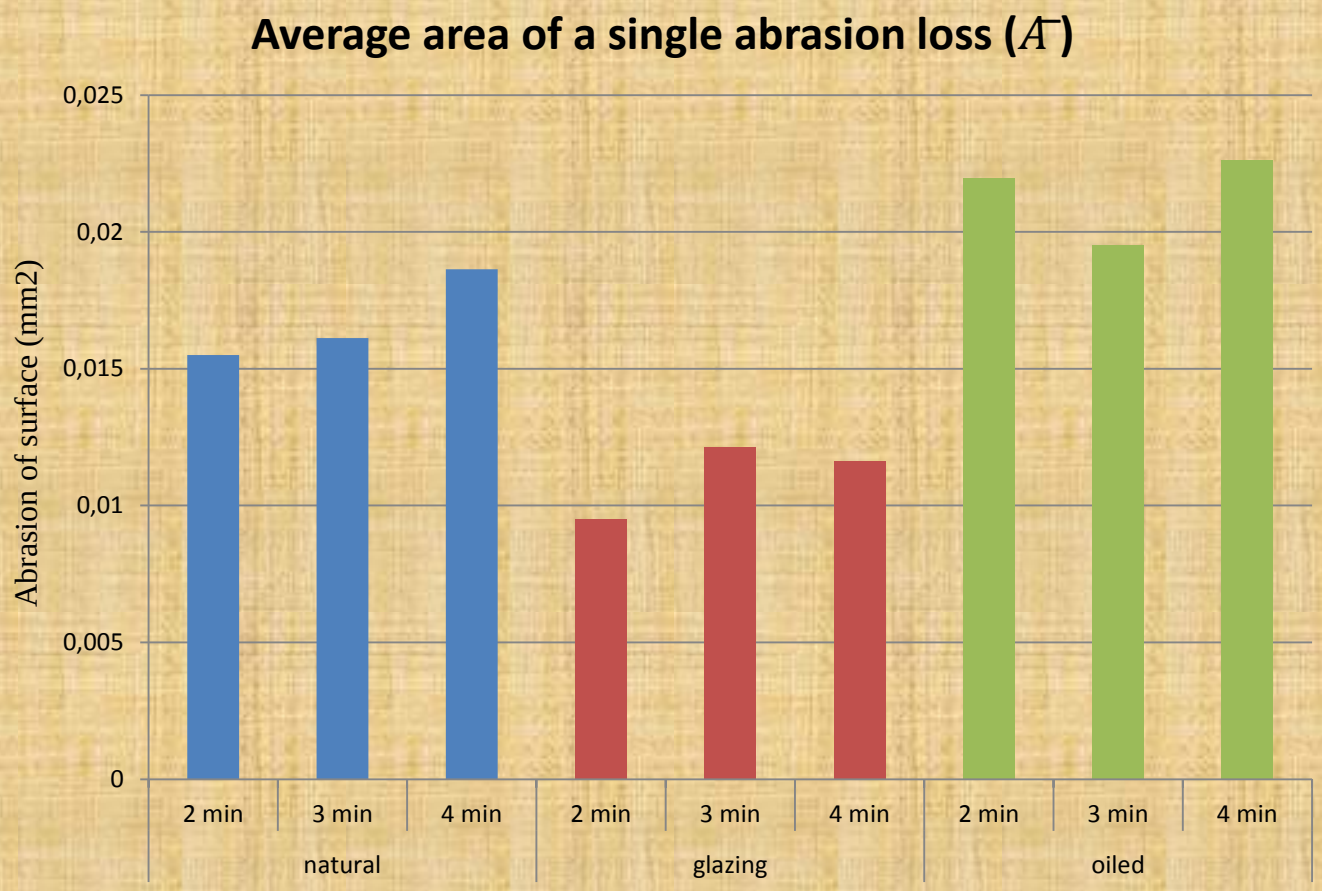


Abrasion of surface for kapur

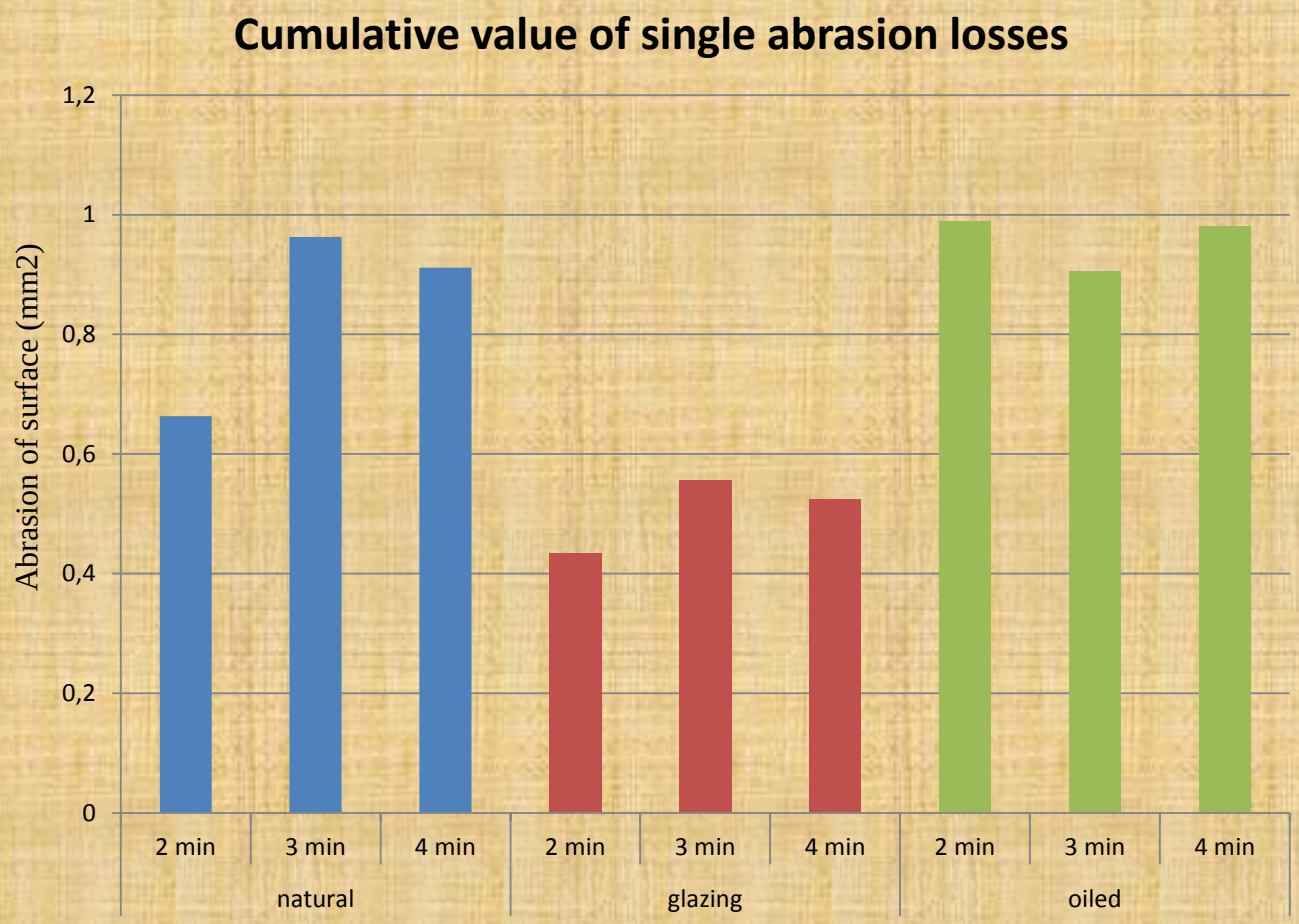



2 KN
3 KN
4 KN

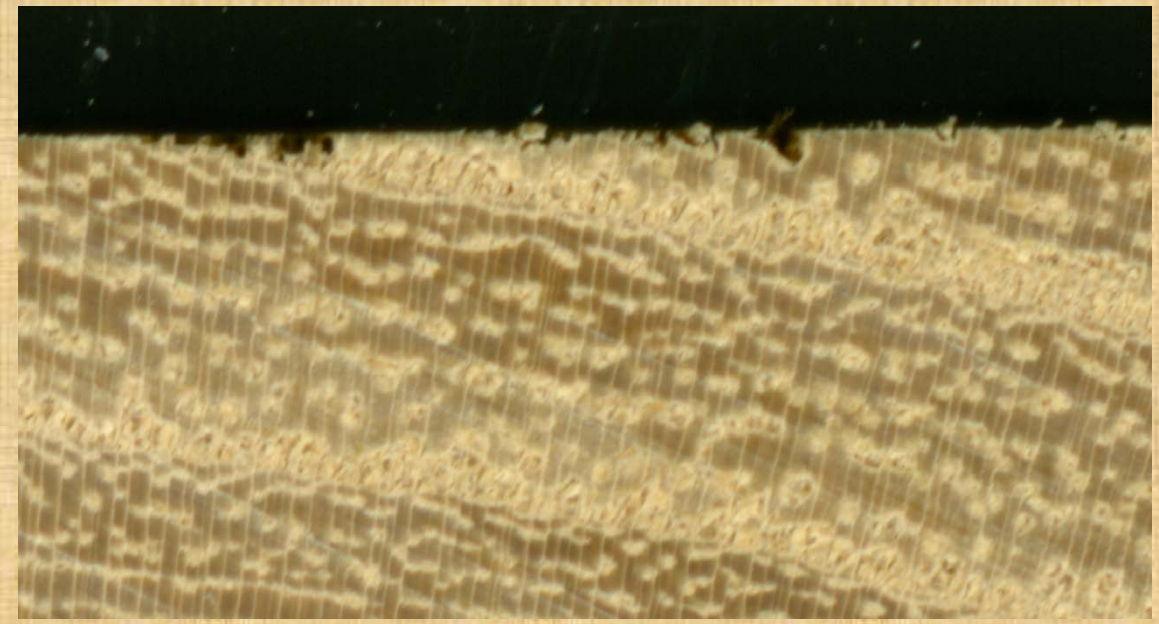
Abrasion of surface for black locust



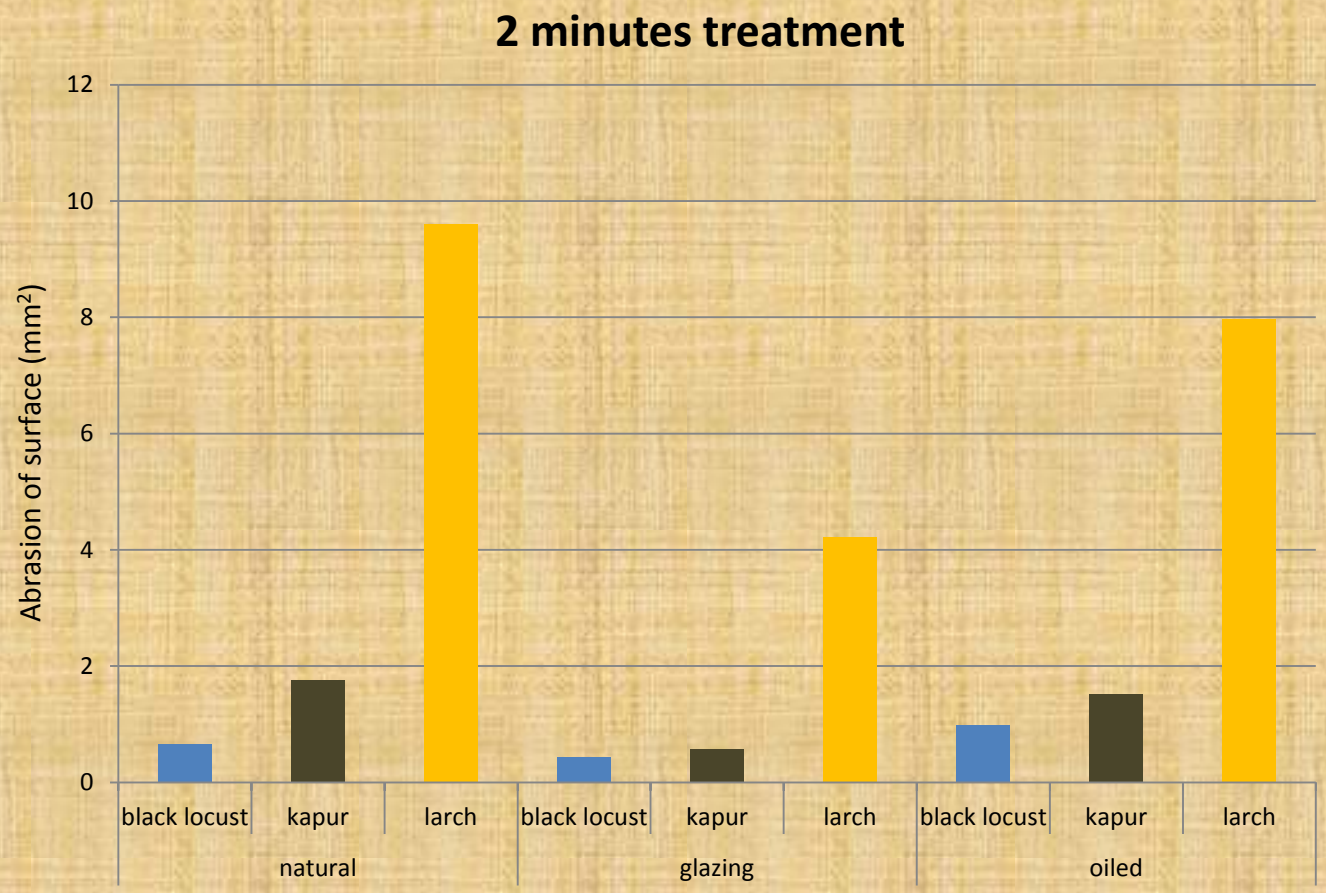
Abrasion of surface for black locust




2AN
3AN
4AN



Cumulative value of single abrasion losses



Conclusion and outlook

- Low density parts of wood, like early wood in softwoods and large vessels in pore rings or vessel groups in the late wood of hardwoods can suffer severe degradation induced by impact energy of water jet
- Surface finishing shows protecting effect against abrasion; glazing have been proved as more effective compare to drying oil
- Longer abrasion times resulted in more sever abrasion losses; the dependence was not linear
- The applied settings of the water jet pressure, distance, are suitable cleaning of the tested hardwood species
- The applied water jet is able to produce artificially aged surfaces, especially for softwoods