THE COMPOUND COMPANY

Destination Green™

Teak Polymer Bio-Composite

The experience of wood with the durability of plastic

Test Results

2. Testing methods & properties

SHR Testing Center (www.shr.nl) has conducted the present research on our behalf. Teak Polymer Bio Composite (TPC) and Teak were tested in order to document their material properties and be able to draw concrete conclusions from their comparison. SHR tests, advises and shares knowledge about wood species, choice of materials and processing. At SHR you will find wood specialists, mathematicians, polymer technologists, physicists and constructors. Highly trained experts with a focus on practice and know-how and with over 25 years of experience.

TPC and Teak have been tested on the following properties:

1. Density (volumetric weight)
2. Moisture uptake and dimensional change caused by water uptake in boiling test
3. Linear thermal expansion
4. Heat accumulation by radiation of the surface
5. Slip resistance of the surface (Pendulum test)
6. Weathering of the surface by UV and water (QUV)
7. Discoloration by staining of the surface
8. Hardness (Brinell hardness)
9. Resistance to surface wear

SHR Weathering test - Materials exposed to UV light

2.1 Test results

1. Density (volumetric weight)

Material	Specific weight [kg/m3]	Standard deviation
Teak	599	0.02
TPC	1374	0.00

Conclusion: Teak Polymer Composite has a higher density compared to teak. By using hollow profiles we can create similar weights for the end product. (NEN-150-1183-1 & EN 15534-1)

2. Moisture uptake an dimensional change caused by water uptake in boiling test

The test pieces of 100 x 100mm were submersed in boiling water for 5 hours. The water uptake and the dimensional changes in length, width and thickness are then determined.

Material	Length change (%)	Width change (%)	Thickness change (%)	Water uptake (%)
Teak	0.08	2.61	1.42	15.69
TPC	0.03	0.03	2.49	1.82

Conclusion: TPC is comparable to teak but with a much lower water uptake. (DIN 1087-1)

2.1 Test results

3. Linear thermal expansion

In this test method the thermal expansion of the material is determined accurately within the temperature ranges -20 °C to + 20 °C and +20 °C to + 80 °C.

	Linear coefficient of thermal expansion [mm/m/°C]	
Material	-20.5°C to 19.8°C	19.8°C to 82.5°C
Teak	0.02 %	0 %
TPC	0.2 %	0.4%

Conclusion: Teak has a slight advantage here over TPC, but overall they are comparable. (NEN-150-11359-2 & EN-15534-1)

4. Heat accumulation by radiation of the surface

In this test the development of temperature of the surface of the materials is measured with an infrared thermometer. During the test the intensity of the radiation energy is stepwise increased and the surface temperature is monitored over time.

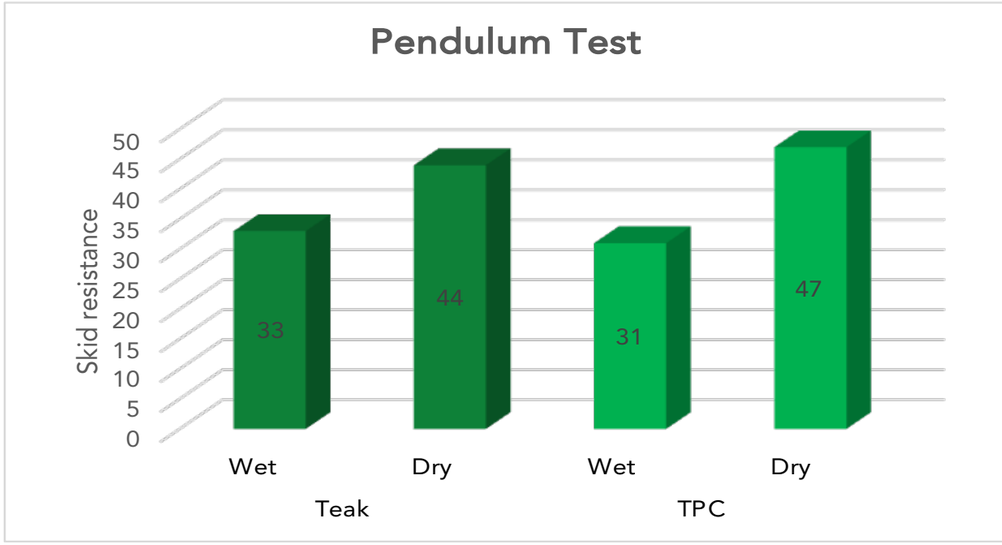
	Average in °C		
Material	Surface temperature at start	Surface temperature in 2 hours	Surface temperature change
Teak	21.4	49.8	28.4
TPC	21.0	52.6	31.6

Conclusion: No significant differences in performance between the two materials.

2.1 Test results

5. Slip resistance of the surface (Pendulum Test)

In this test the dynamical friction coefficient of the material is determined according to CEN-TS 16165, following the so called Pendulum test. The friction is determined under both wet and dry conditions, and in two directions.



Conclusion: No significant differences in performance. The wet and dry slip resistance (slip resistance) of TPC was found within the same range as for Teak.

2.1 Test results

6. Weathering of the surface by UV and water (QUV)

The surface of the products was exposed to UV and water in the QUV test for 12 weeks. An exposure cycle of one week consists of a condensation period followed by a sub cycle of water spray and UV-A 340 irradiation. This one week cycle is repeated 12 times. Every three weeks the Lab-values are measured, with which the colour change can be calculated. The gloss value and weight are measured as well, to calculate the gloss change and the weight loss.

	Color change after 12 weeks of weathering			
Material	ΔL	Δa	Δb	ΔEab
Teak	17.25	7.62	-20.24	-20.24
TPC	8.80	6.61	9.91	14.81

	Gloss change (gloss units)		
Material	Reference	After 12 weeks	Gloss change
Teak	4.74	3.22	1.52
TPC	2.31	2.45	0.14

Conclusion: TPC has an advantage over Teak when it comes to weathering.

TPC after 12 weeks of weathering

Teak after 12 weeks of weathering

2.1 Test results

7. Discoloration by staining of the surface

The resistance of the surface to staining by cold liquids was tested. The liquids were placed on surface, after a specific period the surface was cleaned and inspected on discoloration. Four common liquids were selected, being olive oil, tea, coffee & red wine. The longest exposure time was 16 hours.

Liquid	Teak	TPC
Olive oil	2	2
Red wine	2	4
Coffee	3	5
Tea	5	5
Average	3	4

1 = strong stain effect / 5 = no stain

Conclusion: TPC has an advantage over Teak when it comes to staining.

8. Hardness (Brinell hardness)

The difference in the depth of the imprint after pressing a steel ball in the material, is used as a measure of hardness. The ball has a defined diameter of 10 mm and the test speed is 1 mm/min. The maximum force of 1000 N is applied during 25 seconds.

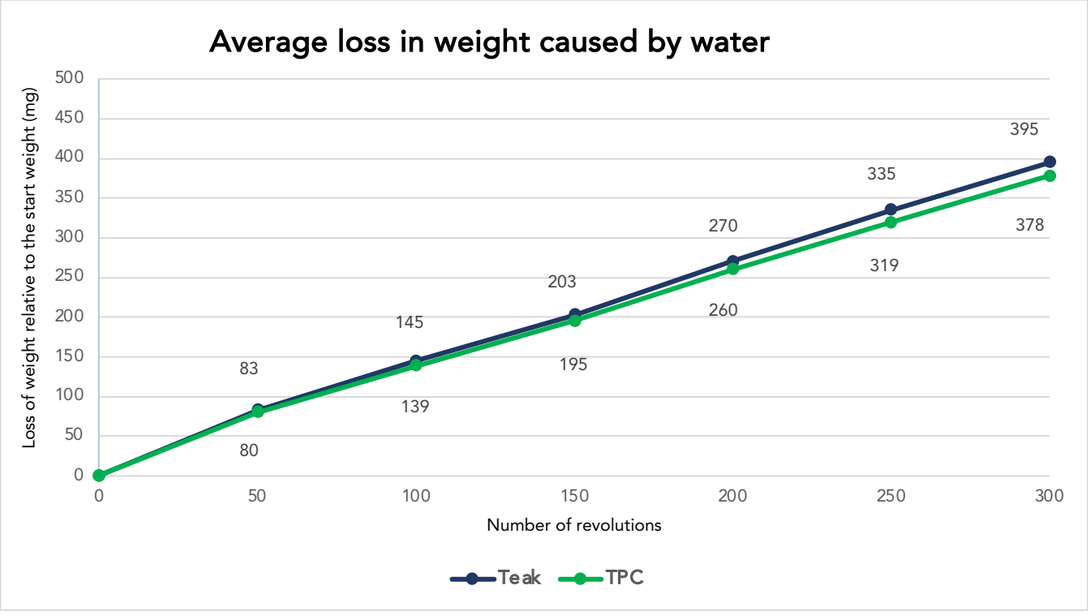
	Average Brinell Hardness	
Material	[N/mm2]	[kg/mm2]
Teak	35.6	3.6
TPC	87.6	8.9

Conclusion: TPC has a strong advantage over Teak when it comes to Brinell hardness.

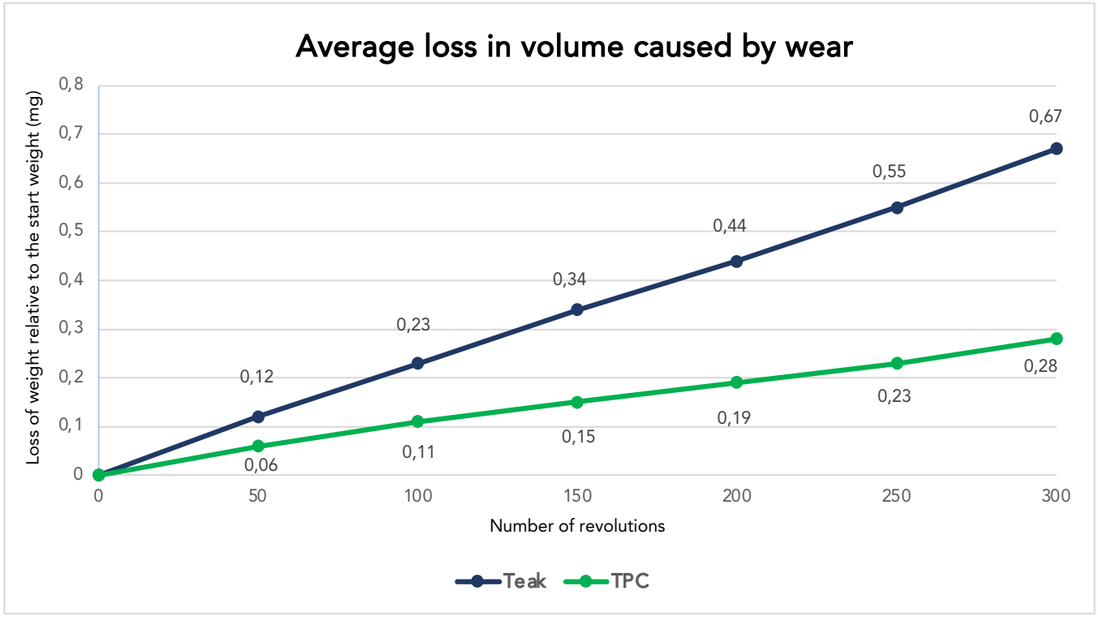
2.1 Test results

9. Resistance to surface wear

The wear of the products is determined by rotating two rubber wheels lined with standardized sandpaper on the flat, un-profiled surface of the sample. After 50, 100, 200 and 300 revolutions the test pieces were weighted to determine the mass loss. The volumetric loss is calculated based on the density. The volumetric loss is used as a measure to indicate the depth of the wear trace on the surface.



2.1 Test results



Conclusion: TPC has an advantage over Teak when it comes to volume loss after wearing.

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