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THE ABRASIVE RESISTANCE OF SEVEN-YEAR OLD *ACACIA MANGIUM* TIMBER FROM KEPONG PLANTATION

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AHMAD SHAKRI MAT SEMAN. 1988. The abrasive resistance of seven-year old *Acacia mangium* timber from Kepong plantation. The abrasive resistance of *Acacia mangium* was assessed and compared with that of kempas (*Koompassia malaccensis*), a common flooring timber. The results showed that *A. mangium* is much inferior to kempas and is not suitable for use as a flooring material.

Key words: *Acacia mangium* - abrasion testing machine - abrasive resistance -abrasive medium - cutting pattern - weight losses - flooring.

Introduction

Acacia mangium is one popular species selected for tree plantations by the Malaysian Forestry Department. The texture of the wood is fairly coarse without growth rings. The density of nine year old wood ranges from 420 to 483 kg/m^3 (Logan & Baloids 1982, Peh *et al.* 1982). The tangential and radial hardness at 15% moisture content are 4300 and 3981 *Newton*, respectively (Tan 1979). In general, the timber has been found to kiln dry well without any serious defects, easy to saw, and gives a smooth and lustrous surface when planed (Tan 1979). Sanding is easy with no torn fibres on the finished face (Peh & Khoo 1985), and it could be nailed very well even at the ends of one-inch boards. The species has already been used on a limited scale, and has been shown to be suitable for products such as particleboard, plywood, panels, and decking for houses and boats (Peh & Khoo 1985). It may also be suitable for parquet and strip flooring. The abrasive resistance against wear test for the suitability of this timber as a flooring material was ascertained in the laboratory. The abrasive resistance of *A. mangium* was compared to that of a common flooring timber, kempas (*Koompassia malaccensis*).

Materials and methods

Preparation of test materials

Test boards of *A. mangium* were obtained from two seven-year old trees from a plantation in Kepong, Peninsular Malaysia. The boards were air dried for eight months and dimensions 50 x 50 x 150 *mm* were cut from heartwood regions. Test

samples of 50 x 12 x 75 *mm* were obtained from these boards. The cutting pattern shown in Figure 1 was used to obtain radial, tangential, and end face samples for attaching to the sample holder (Figure 2) for testing. Five samples were tested for each cutting pattern. The test samples were then conditioned at 22° *C* and 70% relative humidity in a conditioning chamber to a moisture content of about 12% before testing.

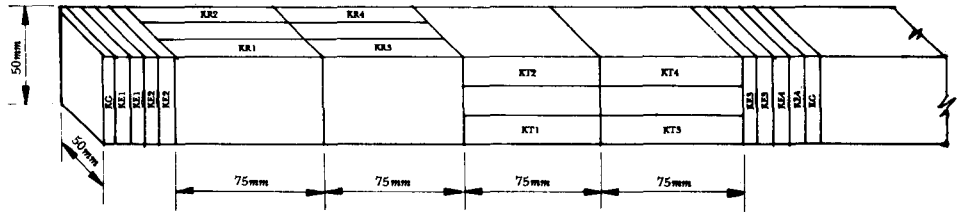

Figure 1. Cutting pattern of wood blocks (KR = radial ; KT = tangential ; KE = end grain ; KG = specific gravity of sample)

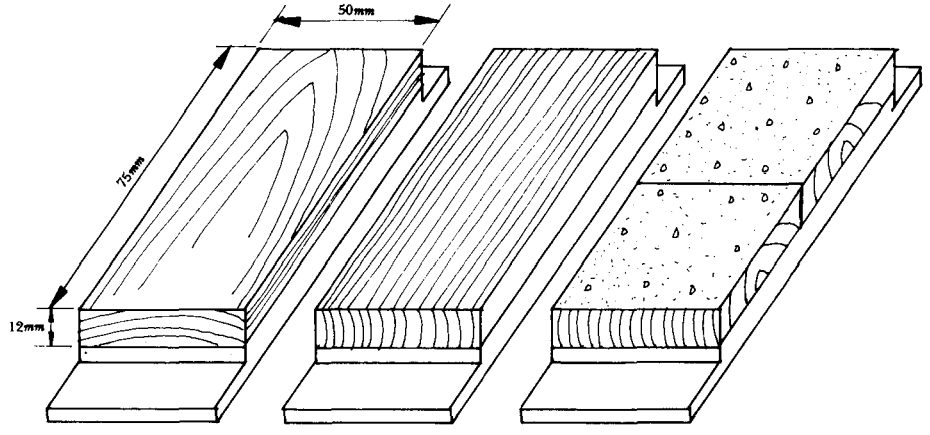

Figure 2. Sample holder with wood blocks attached

Testing procedure

The test procedure adopted in this study follows the American Standard D 1037

-72a (Anonymous 1977). The abrasive medium used was number 80 grit aluminium oxide.

The test samples were mounted onto the holder using epoxy adhesive. The holder which carried a dead weight of 4.5 *kg* on top was used to apply a fixed pressure on the sample during each revolution. The abrasive wear on the sample was obtained by grinding against a revolving steel disk covered with the abrasive medium. The sample holder revolved clockwise at a constant speed of 32.5 *rpm* while the steel disk revolved at a speed of 23.5 *rpm* in the same direction. The sample was lifted a distance of 1.6 *mm* and dropped back into contact with the revolving disk twice during each revolution of the sample holder. The abrasive medium was introduced to the revolving disk via a mechanically agitated hopper at a rate of about 46 $g\ min^{-1}$. The abrasive medium was changed after 2000 revolutions.

The losses in weight of the samples were measured after every 100 revolutions of the revolving disk until a total of 1000 revolutions was achieved.

Results and discussion

Quantitative results of the present abrasive test on *A. mangium* timber, and kempas (Mohd. Shukari 1983) are shown in Figure 3. Average values for the specific gravity, loss in weight after each 100 revolutions and percentage loss in weight after 1000 revolutions of the abrasive disk are given for the three faces tested.

The wearing resistance at different faces for both timbers were different (Figure 3). However for both timbers, the radial face showed the least resistance followed by tangential and end faces. The losses in weight after 1000 revolutions for the radial, tangential and end faces of *A. mangium* were 5.38, 4.25 and 2.05% respectively. The corresponding values for kempas were 0.93, 0.82 and 0.22%, respectively. Thus, kempas performed better than *A. mangium.*

Figure 3 also shows the relationship between the number of revolutions and the weight loss for the two species. A linear relationship was also obtained by other workers for other timbers (Youngquist & Munthe 1948, Mohd. Shukari Midon 1983).

The percentage losses of weight after 1000 revolutions for different faces of *A. mangium* and kempas are illustrated in Figure 3. The losses in weight for *A. mangium* for the radial, tangential, and end faces were about six, five, and nine times as much as for kempas, respectively. These large differences are perhaps due to the obvious difference in densities and other anatomical properties. The factors related to anatomical structures of the wood such as size, arrangement and distribution of the pores and the structure of the fibres have been proven to play important roles in influencing the resistance to wear (Youngquist & Munthe 1948).

Based on the resistance to abrasion, density, strength group and texture of wood, kempas is considered suitable for heavy traffic flooring but preferable for

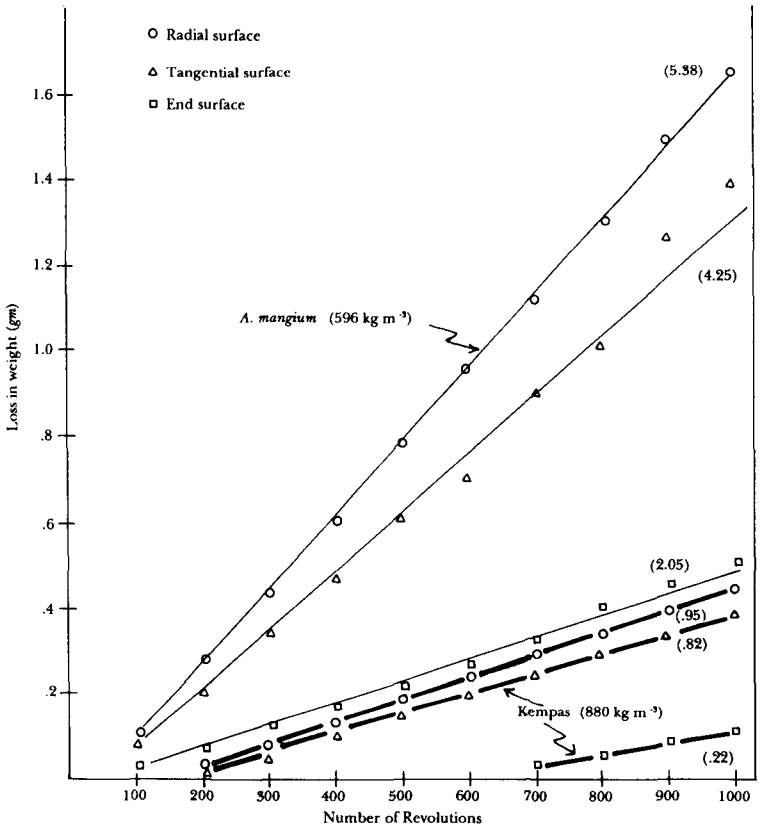

Figure 3. Amount of wear in terms of weight loss from three different surfaces of *A. mangium* after every 100 revolutions of the revolving dish. Percentage loss in weight after 1000 revolutions is shown in parenthesis (Data on Kempas: Mohd. Shukari 1983)

use under medium traffic conditions (Lim 1983). Hence, compared to kempas, *A. mangium* is inferior in its wearing properties, and is deemed not suitable for use as a heavy, medium or light traffic flooring material.

Conclusion

The results obtained from this study show that seven-year old *A. mangium* has inferior wearing properties than kempas in the radial, tangential and end faces. They were below the requirements for light traffic conditions. Hence seven-year old *A. mangium* timber is not suitable for use as a flooring material.

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