

The Drying Characteristics and Quasi-drying Schedules on Seven Species of Plantation-grown Eucalyptus Wood Based on Solid Wood Products

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Abstract: In order to develop solid eucalypt wood products with highly added values, by applying the improved Terazawa's testing methods, the drying characteristics were systematically described and measured and the quasi-drying schedules made were classified and evaluated on seven species of plantation-grown Eucalyptus urophylla, E. grandis, E. urophylla × grandis, E. grandis × urophylla, E. dunnii, E. pellita, E. cloeziana. This result is provided with the important theoretical and practical significances for the utilization of plantation-grown eucalypt wood as solid wood products.

Key words: plantation-grown Eucalyptus; solid wood products; drying characteristics; quasi-drying schedules; the improved Terazawa's testing method

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Eucalyptus widely planted in more than 600 counties in China and reaching about 1.55 million hm², has been just mainly used as wood chips which are the lower added-value products at present owing to facing up on the vital drying problem^[1-4]. Therefore, it is very essential and urgent to solve the drying issues to develop the higher added-value solid eucalypts wood products such as furniture, construction, flooring, decoration and so on.

1 Materials and Methods

1.1 Materials

Sample logs from seven species of Eucalyptus urophylla (EU), E. grandis (EG), E. urophylla × grandis (EUG), E. grandis × urophylla (EGU), E. cloeziana (EC), E. pellita (EP) and E. dunnii (ED) with 12-year old were collected at the State-owned Dongmen Forest Farm in Guangxi Autonomous Region. The defect-free specimens with the dimension of 100 mm (T) × 20 mm (R) × 200 mm (L) for all the above-mentioned fresh logs were prepared for the further experiment.

1.2 Experiment and testing

The testing procedures, the classification and description of drying defects and the grading standard for

the drying characteristics were carried out according to the improved Terazawa's method^[5-6].

2 Results and Discussion

2.1 Drying characteristics

There are a variety of ways in the initial stage of drying, including the end check, the end check extended to the surface, the end split, the surface check extended from the end, the isolated surface check, not only the degree but also the shape of the check is varied greatly all right. The occurrence leading to the initial check is because of the severe tensile stress resulted in the uneven shrinkage between surface layer and interior of sample, which the water of lumber sample along end-surface layer parallel to the fiber direction and surface layer perpendicular to wood grain is removed rapidly. It was obviously found that 7 species of eucalypt wood are prone to occurrence of the deformation, honeycombing and collapse because there are a amount of vested pits which prevent the water from being removed from inter-lumber, the case hardening is apt to occur in high temperature conditions and the interior check is very severe except two species of higher density E. pellita and E. cloeziana, as shown in Tab 1.

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Tab 1 Evaluation of drying characteristics for seven species of eucalyptus wood at 100℃

Species	Initial check	Interior check	CD	CI
EU	3	5	4	5
EG	3	5	4	5
EUG	4	5	4	5
EGU	3	5	4	5
ED	2	3	5	5
EC	3	2	3	3
EP	3	1	2	3

Note: CD, Cross-section deformation; CI, Comprehensive index

2.2 Quasi-drying schedules

Combined with the drying characteristics, two types of drying schedules can be obtained for seven species of plantation grown Eucalyptus wood, as shown in Tab 2. For the former 5 species of lower density eucalyptus wood (below 0.55 g·cm⁻³ basic density), it is more suitable to use the milder drying schedules with comparison to the later 2 species of medium or higher density ones (above 0.7 g·cm⁻³ basic density). Of course, the drying schedules need to be further adjusted in the process of the practical drying.

Tab 2 The quasi-drying schedules on seven eucalypt wood

Species	MC/%	DBT/°C	HD/°C	EMC/%	
EU	above 40	40	2	18.1	
	40 ~ 30	42	3	16.0	
	EG	30 ~ 25	45	5	12.6
	EUG	25 ~ 20	50	8	9.8
	EGU	20 ~ 15	55	12	7.6
ED	15 ~ 12	60	15	6.4	
	below 12	70	20	4.9	
EC	above 40	55	3	15.6	
	40 ~ 30	57	4	14.0	
	30 ~ 25	60	6	11.4	
	EP	25 ~ 20	65	10	8.5
	20 ~ 15	70	15	6.3	
	below 15	80	20	4.9	

Note: MC, Moisture content (%); DBT, Dry bulb temperature (°C); HD, Hygrometric difference (°C); EMC, Equilibrium moisture content (%).

3 Conclusions

- (1) Both check and collapse are the severest drying defects for plantation grown Eucalyptus wood.
- (2) It is reasonable to use the milder drying schedules for the medium or higher density eucalypt wood compared to the lower density one.
- (3) It is necessary to be further revised for the quasi-drying schedules made while applied to drying eucalypt lumber.

References

[1] WU Y, HAYASHIK, LIU Y, et al. Relationships of anatomical characteristics versus shrinkage and collapse properties in plantation grown eucalypt wood from China [J]. J Wood Science, 2006, 52 (3): 187—194.

[2] WU Y, SATORU T, HAYASHIK. Application of near infrared spectroscopy to assessment of difference in color of plantation grown eucalypt timber subjected to heating and seasoning treatments [J]. J Near Infrared Spectroscopy, 2005, 13 (6): 371—376.

[3] WU Y, HAYASHIK, LIU Y, et al. Studies on collapse type shrinkage characteristics in plantation grown eucalypts I. Correlation of basic density and some structural indices with shrinkage and collapse properties [J]. J Forestry Research, 2005, 16 (2): 83—88.

[4] LU Y, WU Y, QIAO J, et al. A study of drying characteristics and drying schedules of Eucalyptus plantation wood [J]. J Central South Forestry University, 2002, 22 (4): 44—49.

[5] HE D, LIN W. The drying characteristics and kiln drying schedules on 24 species of hardwood from South China [J]. China Wood Industry, 1990, 4 (4): 12—18.

[6] TERAZAWA S. An easy method for the Determination of wood drying schedule [J]. Japan Wood Industry, 1965, 20 (5): 216—221.

基于实木用材的七种人工桉树木材的干燥特性及准干燥基准

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摘要: 为了开发高附加值的人工林桉树实木产品, 采用日本学者寺沢真改良百度法, 对普遍引种在中国的尾叶桉、巨桉、尾巨桉、巨尾桉、邓恩桉、粗皮桉、大花序桉 7 种人工林桉树木材的干燥特性进行了系统描述和测定, 同时对制定的 7 种桉树木材的准干燥基准进行了分析和评价。这一研究结果为桉树用作实木用材产品提供了重要的理论依据。

关键词: 人工林桉树; 实木产品; 干燥特性; 准干燥基准; 寺沢真改良百度法

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