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The Effect of Incising on Coal-Tar Creosote Treated Wooden Sleepers to Increase Retention

Amarasinghe W.V.T.D.*, Muthumala C.K.

Research, Development and Training Division, State Timber Corporation, Battaramulla, Sri Lanka
**rctharindu87@gmail.com*

Abstract

Wooden sleepers have become the major source for railway ties in Sri Lanka over a century, which are produced by hardwood species, mainly from forest plantations. However, because of lack of appropriate wood sources, their material quality is declining over a decade, thus the criticism has also arisen against their durability. Moreover, concrete sleepers are becoming popular due to their higher durability and mass production quantity, which is a threat to the market of wooden sleepers. Nevertheless, concrete sleepers show comparatively higher negative environmental impact such as greater carbon emission in their life cycle. Thus, improvement of wooden sleepers is essential to regain their popularity for local utility in terms of durability and as a lesser carbon emitter. Sleepers of *Eucalyptus grandis* (Grandis) and *Dipterocarpus zeylanicus* (Hora) were tested; 35 incised and 35 un-incised sleepers from each species were used for the study. The moisture of the sleepers was reduced below 28% and incisions were applied parallel to grain (or length of the sleepers) by a locally developed incising machine. The depth and length of the incisions and distance between two parallel incision lines are 13 mm, 20 mm and 25 mm respectively. All sleepers of each species were treated by Coal-tar Creosote wood preservative in full cell process according to the BS 144:1997 Standard. Change of the weight of the sleepers was used to estimate the retention capacity of the preservative. The results show that the retention capacity of sleepers of *E. grandis* has increased significantly ($p \leq 0.05$) by 71% (23.5 kgm^{-3}) after incising process. The increment of retention capacity of sleepers of *D. zeylanicus* after incising is only 4%, which is not statistically significant. Moreover, un-incised sleepers of *D. zeylanicus* (121.82±35.21 kgm^{-3}) is significantly higher ($p \leq 0.05$) than un-incised sleepers of *E. grandis* (33.29±12.83 kgm^{-3}). The results concluded that the incising process can be used to increase the retention of *E. grandis* sleepers. However, incising on sleepers of *D. zeylanicus* is not effective. The retention capacity of sleepers of *D. zeylanicus* is higher than sleepers of *E. grandis* with or without incising.

Keywords: Incising, Sleepers, Creosote, Retention, Full cell process