Recycling treated wood waste

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Until recently preservative treated wood waste was generally disposed of by burial in landfill. This practice has however been prohibited in some locations in Australia and more generally efforts are being made to reduce the quantity of waste material, of whatever type, being placed in landfill. In response to these changes in waste disposal practices other options are being sought for recycling treated timber after it has been removed from service. A variety of possibilities have been considered and this paper discusses the current state and future of these options.

Direct or indirect reuse

Given that a significant proportion of treated wood products are removed from service prior to the loss of structural integrity, those products having appropriate dimensions may be suitable for direct reuse. Recycling of this nature may involve a further processing step, *e.g.* resawing, to produce the desired end product. This approach has been used in Italy, where 74% of treated utility poles are reused as garden timbers (1), and whilst it makes efficient use of the original treated commodity, it is however only an interim measure since the reused product will eventually require disposal.

A variety of products have been developed where the treated wood waste has been incorporated into a composite product. Aside from some traditional engineered wood products, *e.g.* particle board (2), wood-cement and wood-plastic composite materials incorporating some proportion of treated wood products may be a viable option (3). The indirect reuse of treated wood in this way does however present some significant problems. For instance, some treated wood is notoriously difficult to glue and where the manufacturing process involves high temperatures, *e.g.* hot pressing of board products, organic preservatives can decompose to volatile products which may present a health risk to manufacturing workers. The use of composite products incorporating treated wood waste may be restricted to applications where the product may actually benefit from the presence of preservative, *e.g.* applications subject to weathering or insect infestation.

Preservative removal - component recycling

An alternative approach to recycling treated wood is to remove and recycle the preservative components, after which the fibre can be reprocessed by conventional means. A considerable amount of the work on preservative extraction has focussed on CCA treated products, where various organic and inorganic acids have been tried with mixed success (4). The use of supercritical carbon dioxide as a solvent for extracting preservatives shows particular promise, although the high capital costs associated with the necessary equipment may inhibit the commercial development of this technology. Patented processes for removing CCA and polyaromatic hydrocarbons (5) from treated wood have been developed. The majority of extraction procedures are designed specifically for certain wood preservatives, such that it would be necessary to have

procedures in place for separating wood waste into streams based on preservative type. The problem of sorting treated from non-treated wood waste is also acknowledged as being significant, and various techniques have been evaluated for this purpose (6).

Biodegradation

Some microorganisms that degrade wood are also able to metabolise certain organic preservatives, producing harmless by-products. A pilot study in South Australia has successfully remediated PCP contaminated soil from a wood preservation site by composting (7). Other microorganisms can solubilise inorganic preservatives such as CCA (8). In general however these organisms only function in a controlled environment (pH, temperature, oxygen level) where the concentration of preservative is relatively low. To achieve reasonable rates of biodegradation it may therefore be necessary to reduce the effective concentration of preservative, *e.g.* by blending treated with untreated waste or by first subjecting the treated wood to an extraction procedure designed to reduce the preservative content. One recent study concluded that acid extraction combined with bacterial fermentation should remove over 90% of CCA components from treated timber (9).

Combustion

The combustion of treated wood waste to produce energy and an ash for recycling is an attractive method of disposal, in that it may not be necessary to sort treated from untreated wood. Much of the work in this area has focussed on the combustion of CCA treated products. The conditions required to minimise the volatilisation of heavy metals and arsenic are now reasonably well established, *i.e.* low temperature pyrolysis under a reducing atmosphere. Semi-industrial scale trials in Europe have demonstrated the potential of the technology for commercialisation, whilst meeting the stringent environmental regulations on particle and gaseous emissions (10).

References

1. Cugliandolo, A., M. Onofrio and A. Quaglino. 1999. Comparative environmental impact analysis of telecommunication utility poles:treated wood and fibreglass. Inter. Res. Group on Wood Preservation. Doc. IRG/WP/99-50136. IRG Secretariat, Stockholm, Sweden.

2. Mengeloglu, F. and D. J. Gardener. 2000. Recycled CCA-treated lumber in flakeboards:evaluation of adhesives and flakes. For. Prod. J. 50:41-45.

3. Wolfe, R. W. and A. Gjinolli. 1999. Durability and strength of cement-bonded wood particle composites made from construction waste. For. Prod. J. 49:24-31.

4. Kazi, K. M. F. and P. A. Cooper. 1998. Solvent extraction of CCA-C from out-of-service wood. Inter. Res. Group on Wood Preservation. Doc. IRG/WP/98-50107. IRG Secretariat, Stockholm, Sweden.

5. Schrive, L. and G. Labat. 1998. Extracting method and plant using a supercritical fluid. Patent WO 98/16288.

6. Peylo, R. and R. D. Peek. 1999. Rapid analysis – chances and limitations. Inter. Res. Group on Wood Preservation. Doc. IRG/WP/99-50131. IRG Secretariat, Stockholm, Sweden.

7. McClure, N. C., C. E. Dandie, R. H. Bentham and I. Singleton, 1999. The remediation of wood preservation sites. Proceedings of the 1999 Contaminated Site Remediation Conference, Fremantle W.A. 529-536.

8. De Groot, R. C. and B. Woodward. 1999. Using copper-tolerant fungi to biodegrade wood treated with copper-based preservatives. Int. Biodet. Biodegrad. 44:17-27.

9. Clausen, C. A. and R. L. Smith. 1998. Removal of CCA from treated wood by oxalic acid extraction, steam explosion and bacterial fermentation. J. Indust. Microbiol. Biotech. 20:251-257.
10. Helsen, L., E. Van den Bulck and J. S. Henry. 1998. Total recycling of CCA treated wood waste by low-temperature pyrolysis. Waste Management 18:571-578.

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