

POTENTIAL FOR RECYCLING WASTE PAPER IN WOOD COMPOSITES USING ISOCYANATE BINDER

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EXTENDED ABSTRACT

The objective of this study was the evaluation of one-layer boards made of various (0:100, 15:85, 25:75, 50:50, 75:25 and 100:0) waste paper flakes: wood particles mixtures (w:w). The waste paper used in these mixing formulations was a mixed waste paper comprised of the same percentage by weight of three paper types (news-, office-, and magazine paper). Furthermore, in order to evaluate the effect of each paper type on board properties, three board types containing 75% wood and 25% of each waste paper type were tested.

In order to minimize secondary fiber damage waste paper were minimally comminuted into flake like geometry using a paper cutter. The wood particles, obtained from a local particleboard mill, were produced from a mixture of several hardwood and softwood species. Polymeric diphenylmethane 4-4-Diisocyanate (PMDI) resin at three different levels of 5, 8 and 10% without or with addition of various amounts of wax (0.7, 1.0, 1.5 and 2.0%) was applied. In total, 48 laboratory made boards were prepared and tested for their mechanical and thickness swelling properties.

During blending process (mixing waste paper and wood particles with resin) waste paper flakes tended to bunch together in clustered masses the more the higher the percentage of waste paper in the furnish and the resin level was. This occurrence is due to the flake like geometry, the small thickness and different bulk density of paper flakes in comparison to wood particles.

The inclusion of waste paper flakes in the production of wood composites make the boards appearance more attractive because they look more artistic than ordinary particleboards and fiberboards made of wood.

In contrast to internal bond, screw holding strength and thickness swelling properties, which deteriorated substantially as the waste paper percentage increased, the bending strength was only slightly affected. By increasing the resin content all properties of boards and particularly internal bond and thickness swelling were improved. The addition of wax reduced considerably the thickness swelling of boards containing waste paper; however, even at 2.0% level, it remained greater compared to the maximum permitted value specified by the relevant standard. Among the three types of waste paper tested, news paper proved to be the most, and magazine paper the least, appropriate for board manufacture. With the exception of screw holding strength, the substitution of wood particles by mixed waste paper flakes in amounts up to 50% resulted in acceptable mechanical properties for specific applications in interior uses.

Key words: waste paper flakes (news paper, office paper, magazine paper), wood particles, waste paper-wood composites, polymeric diisocyanate, mechanical properties, thickness swelling.