Evaluation of environmental impacts of citric acid and glycerol outdoor softwood treatment: case-study.

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Abstract

Over the last few decades, wood modification has been performed to improve wood product technical performance. Using renewable based chemicals for wood modification is an innovative alternative to the non-renewable petrochemicals commonly used. However, it should be kept in mind that having the raw material from renewable sources does not guarantee zero environmental impacts. In this study, the treatment considered uses citric acid and glycerol mixture; two chemical products derived from renewable sources. In the residential building context of Quebec-Canada, the cradle-to-grave life cycle assessment for untreated and treated lodgepole pine wood siding was performed and compared. The results obtained show that the treated wood siding has higher environmental impacts than the untreated wood siding, in spite of its longer service life. This is partially caused by the high contribution of citric acid production used for treatment. The current service life expectancy of treated wood siding was estimated to be 2.8 times longer than the one of untreated wood siding based on standardized durability test and classification (AWPA E 10-12 and ASTM D 2017-05). Sensitivity analysis showed that life cycle impacts of treated wood siding become lower than those from untreated wood siding when service life expectancy reaches 5-times that of untreated wood siding. Life cycle assessment could be used for guidance in developing better treatments to improve their environmental impacts.
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