The structural behavior of hybrid structural insulated panels under pure bending load

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Abstrak

This paper presents the structural behavior of newly-developed hybrid structural insulated panels (SIPs) formed by incorporating lignocellulosic composites—jute fiber composite (JFC) and medium-density fiber (MDF)—as intermediate layers between aluminum skin and an expanded polystyrene (EPS) core. The investigation was conducted as an experimental work. A four-point bending load was performed to create pure bending conditions, and the samples were prepared in accordance with ASTM C 393-00 standards. Testing was performed using a 100 kN servo-hydraulic machine with a loading rate of 5 mm/min. The results show that the incorporation of intermediate JFC or MDF layers enhanced the flexural behavior of the SIPs. The ultimate loads of hybrid SIPs with JFCs or MDF were, respectively, approximately 62.59% and 168.58% higher than the ultimate load achieved by SIPs without intermediate layers. Hybrid SIPs exhibited a much larger area under the load-deflection curve than those of conventional SIPs; this points to the toughness of the material and its ability to sustain larger compression strain prior to reaching their ultimate loads, which prevents them from prematurely failing under buckling or indentation.