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Title: Life-cycle Assessment for Composite Modular Road and Drill Pad Systems

Abstract:
As part of the Environmentally Friendly Drilling (EFD) Program, a life-cycle assessment (attributional) comparing composite matting systems made from recycled HDPE reinforced with wheat straw cellulose against wood matting systems made from pine is performed. The LCA study covers key indicators associated with the range of cradle-to-grave, but stops at the point the products are manufactured. Existing LCA impact category data from numerous peer reviewed LCA studies are applied to modeling the two different matting systems and results indicate that the use of composite matting systems vs. wood matting systems can contribute substantially to the reduction in environmental impacts related to materials use. Key findings include, but aren't limited to, composite matting being favorable (or less environmental impacts) related to acidification (SO2), eutrophication (PO4), energy-use (MJ) and biodiversity loss ($PDF.m^2$). Wood matting showed minimal or slight favorable results related to global warming (CO2) and ozone depletion (C2H4). An economic analysis shows that while the composite matting system has a higher initial cost, the costs are actually lower versus wood during the entire life-cycle due to the composite matting having a longer useful life associated with it.

This LCA stages the future of the research to include an expanded set of environmental impacts associated with the use of wood materials that have been ignored or excluded from previous work conducted on wood materials. The development of this research paper relied heavily on existing data and peer reviewed LCA studies to estimate the key impact indicators. In the future, it would be prudent to develop an independent LCA model using data derived specifically from the regions using or considering the use of composite matting for modular road and drill pad systems. The current state of the art shows shortcomings associated with resource depletion from harvesting wood, namely biotic impacts that are currently overlooked or underweighted, particularly for global warming and ozone depletion. Additionally, future research will incorporate the useful life dynamics and data yielded from ongoing field studies at HARC's testing site in southern Texas so more accurate economic and environmental impacts can be measured and considered by industry and policy makers.