Technology Brief

Evaluation of Surface Friction of Heavy-Duty, 48 X 48 Pallets Made From Recycled HDPE

The All Service All Packaging (ASAP) company of Green Acres, Washington has designed and manufactured a heavy-duty, pallet specifically for the "heavy capacity" shipment of aluminum and steel coil, made from post-consumer material. The recycled high density polyethylene (HDPE) flake used in manufacturing the pallets was supplied by two different processors.

With funding assistance from CWC, ASAP contracted with the William H. Sardo Pallet & Container Research Laboratory at Virginia Polytechnic Institute & State University, to conduct evaluations of their coil pallet for the static coefficient of friction (COF), and for strength and durability performance characteristics *(Reference PL-97-3)* for the "heavy capacity" pallet market.

Friction characteristics may affect pallet performance in unit load material handling applications. Because the friction characteristics of plastic and plastic composites are different than solid wood materials, the test objectives were to:

- measure static COF on relevant surfaces of ASAP's pallet; and
- compare the static COF of the HDPE pallets to traditional wood pallets.

Key Words

Materials:	Recycled HDPE.
Technologies:	Profile extrusion using recycled HDPE and recycled fiberglass.
Applications:	Plastic pallets, lumber.
Market Goals:	Plastics manufacturing; heavy duty pallet manufacturing.
Abstract:	Description of friction testing on recycled plastic pallets.

Materials

A total of three plastic and three wood pallets were used in the test. Each had the same design: 48" x 48" overall dimensions, three stringers (5.5" wide x 5.0" in height), five top deckboards (~1.5" x 5.25"), and no bottom deckboards.

The characteristics of the plastic pallets are:

- Stringers constructed of recycled (HDPE) reinforced with recycled fiberglass
- Deckboards constructed from 100% recycled HDPE
- On average, the HDPE pallets weighed 73% more than the equivalent sized wood skid.

The characteristics of the wood pallets are:

- Stringers constructed from Douglas-fir
- Deckboards constructed from spruce-pine-fir (SPF)

Methods

Each pallet was weighed, then placed on the test surface of a flat steel plate or a set of forktines. The horizontal force required to move the pallet on the test surface, by pulling with a cable connected to the pallet, was measured with Tinius-Olsen equipment and a digital electronic scale.

The three test configurations for both the wood and plastic pallets included:

- Top deck against a steel surface which simulated the steel coil load on the pallet
- Bottom surface of stringer against steel surface
- Bottom surface of top deck against forktines

The static coefficient of friction was then calculated by dividing the horizontal by the normal force (weight).

Results & Discussion

Some slippage of the simulated coil load was noted during forklift handling of the plastic pallets, although there is no direct comparison to be made with wood pallets since they were not handled in this manner. The slippage was not excessive and did not prevent testing.

The static COF for the plastic pallets was roughly 50% of the COF of the wood pallets. This indicates:

- Steel coils may be more likely to slip on the top deck
- Stringers may be more likely to slip on material handling equipment
- Plastic pallets may be more likely to slide on forktines

The coefficient of variation in measurements between like pallets was much lower for HDPE than wood pallets.

Additional trials may be required to determine if the HDPE skids are an acceptable substitute for wood skids with respect to potential slippage. However, beta testing of the pallets under the load of the coil and current strapping configurations has resulted in minimal slippage during actual use.

Improved strapping, skid design modifications, or using abrasive material on forktines are being investigated in the event that friction is deemed inadequate.

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For More Information

For more information call CWC at (206) 443-7746, email info@cwc.org, or visit the CWC Internet Website at www.cwc.org.

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