

Testing Film vs. Paper Wrap Materials on Semi-Automatic Pallet Wrapping Machines

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Executive Summary

Phoenix Stretch Wrappers offers a range of semi-automatic and automatic stretch wrappers. In response to the growing demand for eco-friendly packaging, Phoenix engineers investigated the use of paper wrap on their existing film stretch wrapping machines. This research aimed to assess the feasibility, benefits, challenges, and best practices of integrating paper wrap to meet both environmental and operational objectives.

The evaluation involved analyzing existing paper wrap technologies and testing materials from two potential suppliers. The materials were assessed for their functional advantages and limitations, with the conclusion that existing Phoenix stretch wrappers could accommodate paper wrapping material.

The study focused on one semi-automatic model of stretch wrapper and the technical adjustments required for integrating paper wrap. The results, detailed in Table 1, highlighted the differences in performance between the two materials.

A comparison between paper wrap and plastic film was conducted. The findings, summarized in Table 2, indicated that while paper wrap offers environmental benefits, it presents challenges such as lower stretchability and higher costs.

Testing revealed that Material A was more compatible with existing equipment, though both materials had distinct performance characteristics as shown in Table 3. A cost analysis (Table 4) illustrated that while paper wrap is currently more expensive, ongoing advancements could make it a viable industry option in the future.

Phoenix Stretch Wrappers can effectively use paper wrap as a sustainable alternative to plastic film. Phoenix engineers are equipped to retrofit existing semi-automatic wrappers for eco-friendly operations.

Introduction

Phoenix Stretch Wrappers offers a full line of semi-automatic and automatic stretch wrapping solutions. As those responsible for load unitizing in the packaging process seek eco-friendly packaging solutions, the use of paper wrap on film stretch wrapping machines has become a popular alternative. Made from renewable resources, paper wrap is biodegradable and can be recycled. Phoenix engineers explored the feasibility, benefits, challenges, and best practices associated with using paper wrap with existing Phoenix stretch wrapping machines. The goal is to provide a comprehensive understanding of how paper wrap can be effectively used to meet both environmental and operational objectives.



Paper Wrap Material Running on a Phoenix Stretch Wrapper (left); Carriage with Paper Wrap Material (right)

Methodology

The process for evaluating paper wrapping materials on existing Phoenix Stretch Wrappers involved analyzing existing paper wrap technologies and the companies that supply them. The materials were evaluated for their functional advantages as well as

limitations. The team identified two potential suppliers and materials, which they tested. Based on the outcomes, Phoenix concluded that existing stretch wrappers could be used with paper wrapping material.

Machine Compatibility

Phoenix evaluated the two paper wrap materials selected for this exercise. One semi-automatic model of stretch wrapper could handle the paper wrap. Integrating paper wrap into film stretch wrapping machines involves several technical considerations. Depending on the material (A or B), the wrapper experienced issues with residue and excess noise from the film carriage rollers. For Material A, the transition from film to paper required only the removal of the wrapper's pre-stretch chain. Material B required more changes of the stretch wrapper to perform. Table 1 details the differences between the two materials experienced by Phoenix engineers.

Table 1 — Material Comparison

Options	Paper Wrap Material A	Paper Wrap Material B
Pre-stretch	0%	0%
Post-stretch	Minimal	Minimal
Film Core Diameter	3"	2"
Roping Bar Used	Yes	No due to material tackiness
Carriage Rollers	No issue	Residue build up
Programming	No modifications required	No modifications required
Carriage spring	No modifications required	No modifications required

Comparison Benchmarks

Phoenix engineers evaluated a number of criteria to determine the advantages and disadvantages of paper wrap compared to the plastic stretch film that Phoenix wrappers

had been designed to use. Table 2 summarizes the items compared and the results observed by the testing team.

Table 2 – Comparison of Paper vs. Plastic Film Materials

Criteria	Paper Wrap Stretch	Plastic Film Wrap
Strength and Durability	• Low stretchability • Less tear-resistant; certain pallet loads. may present a risk of puncturing or tearing.	• High stretchability • Tear-resistant to sharp-edged pallet loads.
Cost	Higher than plastic.	Lower than paper.
Ease of use	• Decreased stretchability must be accounted for to reduce tearing during the wrapping process. • Frequent film changeover. • No Auto-Cut function.	• Increased stretchability reduces tearing, but film strength must be sufficient to wrap without ripping. • Auto-Cut function.
Versatility	Minimal stretchability limits the shapes and sizes of pallet load best for paper wrap.	Highly versatile; can conform to a wider range of pallet load shapes and sizes.
Breathability	Material allows for air circulation, ideal for items sensitive to moisture buildup.	Required slitting option.
Wrap Roll Storage	• Bulkier • Not adapted for all the environments, e.g., humid storage locations	• Takes up less space due to its thin nature. • Adapted to almost all environments
Transparency	• Opaque • Hides wrapped items; ideal when discrete pallet loads are desired.	• Transparent • High visibility of wrapped items when easily identifiable pallet loads are desired.
Load Sealing Options	Tape or glue required to secure film.	Film secured using normal interface method.

Test Results and Cost Analysis

Table 3 shows the results of the two types of paper wrap materials tested on the stretch wrapping machine. Overall, Material A adapted more easily to use on a stretch wrapping machine designed for plastic film. While the testing team identified one paper wrap material that adapted readily to the existing equipment configuration, a low-level cost analysis (Table 4) illustrates that time and new, more cost-effective materials may be needed to bring paper wrapped pallets to the industry as a standard solution.

Table 3 – Comparison of Paper Wrap Materials

Options	Paper Wrap Material A	Paper Wrap Material B
Carriage	2150 Film	2150 Film
Stretch	0%	0%
Wrapped 2"	Low retention	Higher Retention
Wrapped 10"	Low retention	Higher Retention
Post Stretch	¼ Setting	¾ setting
Pre-Stretch	0%	0%
Noise Level	Not significant	High (>100 dba)
Type of loads	Type A (perfectly square)	Type A (perfectly square)
Load Retention	Low	Higher

Table 4 — Low-Level Cost Analysis

Options	Paper Wrap Material A	Film Semi-Automatic Wrap	Paper Wrap Material B
Crepe Stretch	N/A	245%	35%
Length of Film Required	214.84	62.3	214.84
\$/ft. Film	0.0130\$	0.009\$	0.0412\$
Cost/Load	2.79\$	0.56\$	8.86\$
# Loads/Roll	9	80	4

Conclusion

Existing Phoenix Stretch Wrappers can be used with paper wrap as a viable and sustainable alternative to plastic films. While there are challenges to overcome, the environmental benefits, coupled with advancements in paper wrap technology, make it a compelling option for companies with sustainability goals. Phoenix can support customers who wish to start using the environmentally friendly paper wrap by recommending specific material characteristics as well as assist in the retrofit process of semi-automatic wrappers.