Ultrasonic Sealing of Bio-based, Sustainable Packaging Films

Consumer demand for more environmentally-friendly packaging continues to drive consumer packaged goods manufacturers, film converters, and co-packers to search for methods to seal the wide variety of films that are emerging to meet this demand. For those companies seeking to meet this consumer demand with more sustainable packaging solutions, their only option has been to continue using conventional heat sealing methods, but with increasingly larger seal areas. Adding more material to accommodate heat seals is counter-productive to sustainability.

EWI has pioneered unique applications of ultrasonic technologies for package sealing, including the EWI GreenSeal™ technology as demonstrated on reciprocating and rotary-style VFFS packaging machines. EWI conducted a research program to validate the feasibility of using ultrasonics to seal bio-based films. The objectives of the study were:

- Demonstrate the feasibility of ultrasonic sealing of bio-based films
- Investigate the critical tooling designs and sealing parameters necessary to seal the films
- Evaluate the resulting seal strength

The scope of this initial study was somewhat limited as it was not possible to acquire samples of all sustainable, bio-based films. The parameters of the study were as follows:

- Tool designs studied include male knurl, female knurl, single ridge, five ridge, and flat, on five titanium horns and five stainless steel anvils to be used in a variety of combinations.
- Films studied include foil films, biodegradeable films, film-coated paper, multi-color films, and films for produce packaging.

Twelve unique materials were used in preliminary trials, welding with every anvil detail and the flat faced horn. A description of each material used and its nominal thickness are described in **Table 1**. A description of the defining aspect of each group is shown in **Table 2**.

This study established a baseline of data that provides confidence in the use of ultrasonics for sealing of sustainable packaging materials. Additional studies across even broader types of sustainable films will be undertaken as those films become available.

EWI is seeking additional films to expand the knowledge base of ultrasonic sealing of bio-based films. If you would like to contribute a specific film for evaluation in the next study, please contact Dale Robinson at **drobinson@ewi.org, 614.688.5232.**

TABLE 1: Summary of Material, Thickness, and Group

No.	Group	Material	Thickness
1	I	Paper/foil/coex	0.38
2		Paper//PLA (thick)	0.53
3		Paper//PLA (thin)	0.21
4	II	PET//LLDPE (white)	0.14
5		PET//LLDPF(clear)	0.14
6	III	PET//foil//LEL coex	0.10
7		PET//foil//EMAA	0.07
8		PET//foil//LLDPE	0.09
9	III& IV	PET//foil//ACN	0.09
10	IV	Paper//foil//ACN	0.13
11	V	OPP/PE coex	0.05
12		PE c|oex	0.03

TABLE 2: Material Groups

Group	Description
I	Films with fibreform paper layer
II	Films with nylon and LDPE (white and clear) interlayers
III	Films with an Aluminum foil interlayer and varying materials on the weld side
IV	Films with ACN (acrylonitrile) sealing layer
V	Films with an ink and anti-fog varnish layer (packaging films)

Trial results made clear the importance of selecting the proper tooling for a given thin film material, as well as demonstrated that optimization of welding parameters is critical to achieving maximum bond strength.

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