Heat Sealing

A Beginner's Guide

from

Packaging Automation Ltd

Beginner's Guide to Heat Sealing

Contents

Advantages of Heat Sealing

Why is heat sealing used as a form of packaging?

- Heat sealing produces a hermetic seal, which is important if a modified atmosphere (a gas mixture) is being used.
- Heat sealed packs can be used to present products in an aesthetically pleasing way.
- On-the-shelf presentation can be improved by using heat sealed packs.
- Heat sealed packs are sturdier than packs sealed by other methods aiding transportation and storage and therefore reducing wastage due to damaged packs.
- The pack can often be designed to be used as a cooking container.
- Heat sealing machines offer flexibility and allow different pack sizes to be sealed with minimal change parts.

The following are examples of the type of packaging that can be sealed:

Packaging Materials

Why are different tray materials used?

- The process may dictate which material must be used e.g. for a frozen, chilled, or cooked in the pack product.
- The product contained in the tray may mean one material is more suitable than another.
- The choice may be dictated by the cost of the tray material.
- Marketing and consumer perception may influence the choice because of the aesthetic qualities of the material.

What are the different tray materials used in heat sealing?

Name	**Abbrev.**
Polypropylene	PP
Crystallised polyester terephthalate	C-PET
Amorphous polyester terephthalate	A-PET
Polyvinyl chloride	PVC
Polystyrene	PS
High impact polystyrene	HIPS
High density polyethylene	HDPE
Aluminium foil	
Board (pressed, folded, pulp)	

What are the properties of these tray materials and why might they be chosen?

Material	Abbrev.	Suitable Applications
Polypropylene	PP	• Microwaveable, freezable, suitable for MAP. • Available in any colour as well as clear. • Can be surface printed. • Relatively cheap.
Crystallised polyester terephthalate	C-PET	• Ovenable, microwaveable, freezable, suitable for MAP. • Colours offered are limited to white, black and brown. • Can not be surface printed. • Relatively expensive.
Amorphous polyester terephthalate	A-PET	• Not suitable for use in the microwave or oven. • Freezable and suitable for MAP. • Available in any colour as well as clear. • Can be surface printed. • More expensive than PVC.
Polyvinyl chloride	PVC	• Not suitable for use in the microwave, oven or freezer. • Suitable for MAP, but performance will be improved with a PE coating. • Available in any colour as well as clear. • Can be surface printed. • Relatively cheap. • Environmental issues are making this a less popular choice than A-PET.

Material	Abbrev.	Suitable Applications
Polystyrene	PS	• Not suitable for use in the microwave, oven or freezer. • Not suitable for MAP. • Very brittle material. • Available in any colour. • Cheap.
High impact polystyrene	HIPS	• Not suitable for use in the microwave or oven. • Suitable for freezing. • Not suitable for MAP. • Available in any colour. • Cheap. • Not as brittle as PS.
High density polyethylene	HDPE	• Not suitable for use in the microwave or oven. • Suitable for freezing. • Suitable for MAP, very high gas barrier properties. • Limited to white, black or clear. • Can be surface printed. • Fairly expensive.
Aluminium foil – crinkle wall		• Suitable for freezing. • Not suitable for MAP. • Cannot be surface printed. • Fairly cheap. • Cannot be sealed hermetically – mostly used with board lids and crimping.
Aluminium foil – smooth wall		• Suitable for use in the oven and most microwaves. • Suitable for freezing. • Suitable for MAP. • Available in different colours. • Cannot be surface printed. • Can be difficult to seal unless lacquered. • Product contamination checks have to be carried out with an x-ray machine. • Expensive.
Board (pressed, folded, pulp)		• Suitable for use in the oven, microwave and freezer. • Not suitable for MAP. • Can be surface printed. • Require a sealant layer to enable sealing. • Fairly cheap.

Which tray materials are used for the most common applications?

Application	**Materials used**
Microwaveable ready meals	PP, C-Pet, Board
Ovenable ready meals	C-Pet, Smooth wall foil, Crinkle wall foil, Board
Salads	A-Pet, PVC
Vegetables	PP, Smooth wall foil, Crinkle wall foil
Desserts	A-Pet, PVC
Puddings	PP, C-Pet
Dairy products	PP, PS
Confectionery	PVC, PS
Fish	Smooth wall foil, PP, PVC, A-Pet
Meat	A-Pet, PVC, Smooth wall foil
Soup	PP, A-Pet

What are the common lidding materials used in heat sealing?

Heat sealing films are manufactured in two different ways:

- Mono layers - which are a single layer of material with an adhesive coating. Different adhesives used include A-Pet (used for high temperatures e.g. for cooking), Vinyl Acetate (EVA) (used for microwave products only), and Polyethylene (PE).
- Laminates - which are multi layer films formed from two or more different substrate materials.
- The sealant layer is dictated by the tray material, the type of seal needed (e.g. weld or peel) and cost.

The most common materials used are:

Material	**Comments**
Polyester (PET)	This is the most common base material used and is the most heat resistant material (up to 235°c). It offers excellent clarity and can be supplied printed.
Nylon (OPA)	This is technically known as “Orientated Polyamide”. It is heat resistant up to 190°c and has to be laminated to Polyethylene. It is tear resistant, slightly opaque and can be supplied printed.
Polypropylene (OPP)	This is technically known as “Orientated Polypropylene”. It is heat resistant up to 160°c and has to be laminated to cast polypropylene. It will only seal to polypropylene. It can be supplied printed.
Aluminium foil	Can be supplied on a reel and pre-cut to the right shape and size.
Board	Usually pre-cut to the right shape and size.

How does heat sealing work?

Heat sealing is a process, which uses three variables: heat, force and time. It describes the process of transferring heat by means of conduction through a material at a given force for a period of time.

Different seal strengths can be achieved by

- Modifying the sealant layer of material (tray and film).
- By increasing or decreasing any of the three variables (time, temperature and seal force).

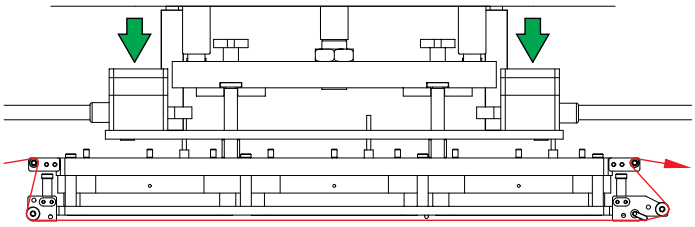
Different seal strengths include:

- Weld (film cannot be peeled away from tray at all).
- Cold peel (film can be peeled away from tray when it is cold).
- Cold weld/hot peel (film peels easily when the tray and film have been heated e.g. after cooking but forms a hermetic seal when cold).
- And any variety of strengths in between these.
- However, it is always worth considering the impact of contamination (e.g. food or oil) on the tray or film – this will have an impact on the seal strength achieved. If contamination is present it may be necessary to increase any of the three variables.

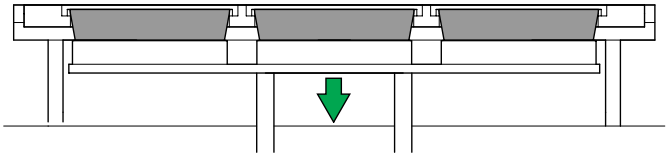
The following diagrams illustrate the process, which takes place within a heat sealing machine:

PA SEALING OPERATION

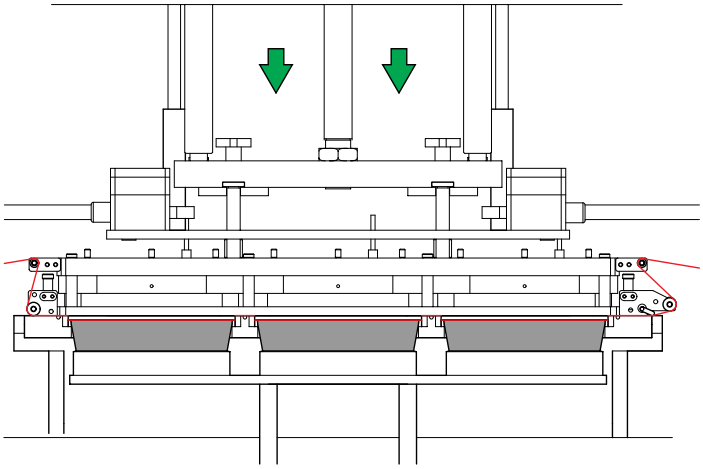
1. With the Top tool in its raised position, new Film ——— is fed beneath



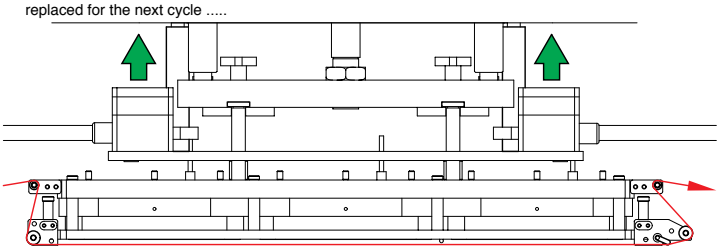
..... Unsealed packs are lowered into the Base tool and the Top tool is pushed down



2. Downward force is applied, sealing and trimming the film to the packs.



3. The Top tool is raised and the waste Film ——— is replaced for the next cycle .....



..... Sealed packs are ejected from the Base tool