Getting it Right

Meyer Seals® guide to induction liners and the induction sealing process

MEYER® since 1879 Seals

The SEALutions Company

Welcome to the World of Meyer Seals®

Meyer Seals® is Europe's leading manufacturer of induction closure liners, with over 140 years of experience in supplying SEALutions globally across all continents to various industries.

Meyer Seals® Group, headquartered in Germany, has state-of-the-art manufacturing facilities based in Germany and Thailand with distribution offices in India and China.

Meyer Seals® group is recognised throughout the industry for its quality, reliability, consistency and performance. These certified system consists of DIN EN ISO 9001, BRCGS Packaging (Brand Reputation Compliance Global Standards for Packaging Materials), EMAS (Eco-Management and Audit Scheme) underline the high demands Meyer Seals® place on the quality of their products and services.

Meyer Seals® induction product families can be identified in four main product groups:

ALKOsafe™ ALKOseal™ ALKOflex™ ALKOvent™

Contents

What are the benefits of induction cap sealing?

TRADITIONAL BENEFITS

PROVIDES TAMPER EVIDENCE
As the liner must be removed or destroyed in order to access the product tamper evidence is provided for the consumer.

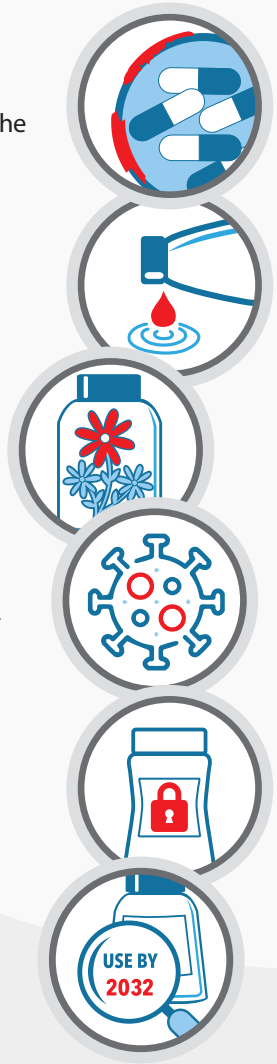
LEAK PREVENTION
Ensures your product will not leak during storage or transportation, guaranteeing your consumer is ready to use your product.

FRESHNESS PRESERVATION
Acts as hermetic seal which prevents oxygen and moisture transmission into the product.

HERMETIC SEALING
The high temperatures required to hermetically seal containers destroys pathogenic bacteria, preventing the entry of micro-organisms and maintains the commercial sterility of the contents.

PILFERAGE PROTECTION
Prevents the sealed container from being broken into, consumers can be confident in the integrity of the product

INCREASES SHELF LIFE
Maintains a hermetic seal which in turn prevents oxygen and moisture transmission into the product.



VALUE ADDED BENEFITS

COUNTERFEIT PROTECTION
In response to counterfeiters, induction seals have options such as colour-shifting inks, micro-printing, UV inks and holograms, as well as many other options.

SUSTAINABILITY
Minimal energy requirements and overall material reduction compared to conduction sealing systems, a more sustainable choice.

COST & WEIGHT REDUCTION
Improves the overall package integrity allowing weight reduction of the containers neck and shoulder area, plus on overall weight reduction of the closure.

PRESERVES PRODUCT AROMA
Loss, fading of sensory elements such of aromas and fragrances is counterproductive induction sealing prevents this from happening.

E-COMMERCE OPPORTUNITY
Requested by many online retailers and distributors as part of an e-commerce packaging strategy.

PREVENTS BLOATING & PANELLING
Vented induction liners ensures pressure equalisation with the surrounding environment preventing distortion of the container.

BRAND RECOGNITION
Utilising the printing capabilities, brand owners can communicate branding and promotional messages for consumers.

Understanding the global markets for induction cap sealing

DAIRY
Represents a business enterprise that deals with the processing and harvesting of animal milk for human consumption.

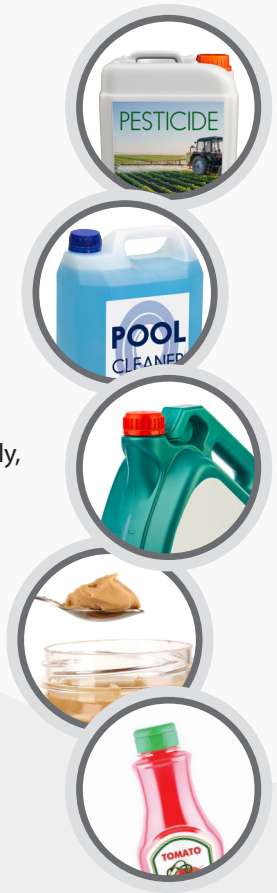
ENERGY & HEALTH DRINKS
These drinks often contain higher amounts of caffeine compared to fruit juices and soft drinks, and may also contain taurine, riboflavin, pyridoxine, and various herbal derivatives.

POWDERED BEVERAGES
Non-alcoholic drinks which can be enriched with vitamins and minerals in the form of water soluble powder.

SPICES
Are the bark, roots, seeds, buds or berries of plants, most of which grow naturally.

PERSONAL CARE & COSMETICS
Usually divided into five main business segments: skincare, haircare, make-up, fragrances and toiletries.

PHARMACEUTICAL & NUTRACEUTICAL
Synthetically manufactured pain relief or elements found in nature for the purpose of maintaining or improving health.



AGRICULTURAL CHEMICAL
Encompasses the various chemical products used within the agricultural industry.

HOUSEHOLD CHEMICAL
Commonly found and used in and around the household and are designed to assist cleaning, pest control and for general hygiene purposes.

MOTOR OIL AND LUBRICANTS
Keeping mechanical equipment operating smoothly and safely, with the main purpose of limiting friction and cooling down surfaces.

FOOD
Any substance consumed to provide nutrition. Food is usually of plant, animal or fungal origin.

SAUCES, SPREADS, DRESSINGS AND CONDIMENTS
This food category is diversifying as manufacturers add new flavours and varieties.

Sustainability and Recyclability

There are many environmental areas that closure manufacturers, brand owners, private label fillers and retailers will consider when striving for sustainability and recyclability options.

Packaging material weight reduction, renewable packaging resources, reduced carbon footprint, effective reduction in transportation, utilising renewable energy savings are just a few of them. Hermetical sealed induction liners currently play a key role in achieving these sustainability and recyclability targets.

Environmental Management Systems

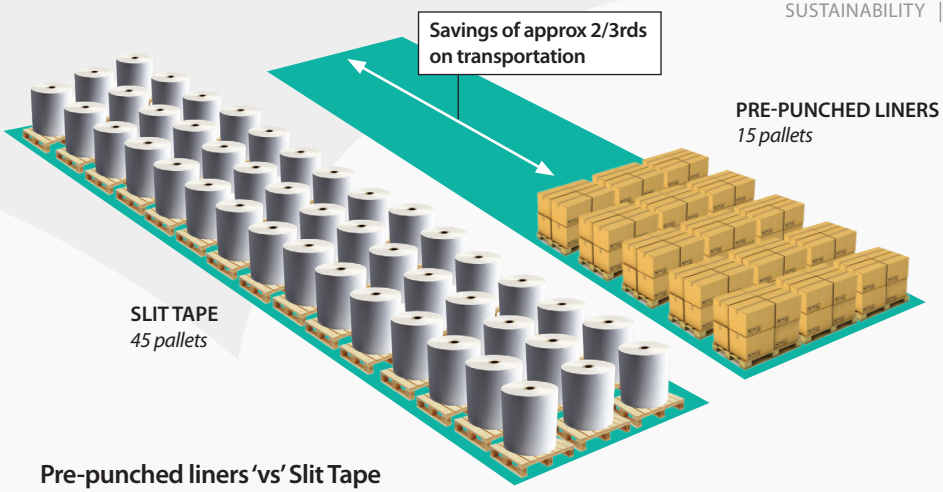
Meyer Seals® has adopted EMAS (Environmental management & audit scheme) one of the best and robust environmental management tools on the market that focuses on continual improvement of environmental performance of the organisation.

Why has Meyer Seals® adopted EMAS?

Because of its total transparency to the industry, EMAS details out publicly Meyer Seals® commitment to both sustainability and recyclability. Meyer Seals® is independently audited by EMAS and the findings are openly communicated.

Induction sealing weight reduction

Hermetic induction sealing allows significant weight reduction of both the closure and the Container, whilst retaining maximum packaging integrity. Elimination of the tamper evident ring from the closure as the induction seal is seen by consumers as tamper evidence. In turn the neck area of the container can be reduced due to the elimination of tamper evident ring along with the ability to achieve side wall reduction.



Pre-punched liners 'vs' Slit Tape

Meyer Seals® is the world leader in offering pre-punched induction liners with transportation savings of up to 2/3rds fewer pallets required to transport pre-punched liners, compared to slit width tape. Therefore, transportation costs and CO^2 emissions are 2/3rds less than with pre-punched liners, in addition up to 2/3rds savings in storage/warehousing cost. By punching larger tape widths internally at Meyer Seals® resulting in better utilization of the raw materials, there is a >40% skeleton yield loss on producing slit width tape, but only a <20% yield loss associated to in-house punching at Meyer Seals®.

Meyer Seals® partners with Interseroh™ 'made for recycling'.

Interseroh independently assesses the extent to which materials that are used to manufacture induction liners can be returned back into the material loop at the end of the product's useful life, therefore closing the material loop and ensuring a circular economy. Interseroh™ uses a three-stage points system which covers the following:

- Determining whether the consumer can assign the induction liner and the re-seal secondary liner located within the closure can be allocated to the right collection system without any complication eliminating post waste segregation;
- Assessing how the total induction package performs during the sorting process at the recycling centre;
- Evaluating how suitable the induction liner is for recycling and determining if the overall design features ensures that the recycling process is effective.

Induction liners that pass Interseroh's assessment are able to carry the "Made for Recycling" approval if they score at least 18 out of 20 points

Products that have been approved throughout this document have been assigned with the Interseroh 'made for recycling' logo

Sustainability and Recyclability

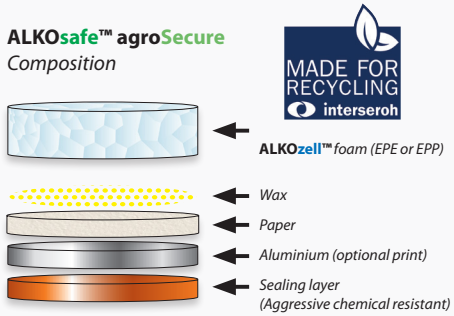
Recyclable initiatives

The composition of **ALKOseal™ glasSecure™** with either an EPE or EPP secondary re-seal liner is the world's first fully recognised recyclable induction liner, with the secondary EPE or EPP being fully compatible with the closure material construction, by marrying up these plastics compatibilities between the secondary re-seal liner and the closure resulting in a mono material that negates the need for post-consumer waste segregation. The primary induction seal that is removed by the consumer, being aluminium foil that can be recycled alongside aluminium beverage cans, which has been approved by the European interseroh zero waste solutions.

Agricultural / lubricant market innovation

Meyer Seals® **ALKOsafe™ agroSecure™** that is used for the agricultural and lubricant markets, in helping to meet their sustainable goals has now eliminated the PET layer making the overall composition structure leaner for these heavy-duty industries.

ALKOsafe™ agroSecure
Composition



Manufacturing sustainability

The segregation and recycling internally of the waste liner skeleton that is produced gives an overall savings of up to 40%.

PEFC
PEFC/04-31-2197

Sustainable forest management

Secondary re-seal induction two-piece liners that are made of wood pulp come from a certified sustainability forestry source with more than 304 million hectares globally.

Pack weight reduction for demanding contents

Meyer Seals® vented induction liners ALKOvent™ have enabled further material reduction of the container by eliminating the need for co-ex multi-layer/multi material container constructions often used in conjunction with demanding contents that produce gas, or via container transportation with altitude variation.

Renewable energy solutions

Meyer Seals® utilises 100% renewable energy in its manufacturing process that is certified green and is generated via Wind power, Solar power, Biomass, Hydroelectricity and Geothermal power.

Eliminating food waste

Hermetic induction sealing extends the shelf life of the product preventing food waste within the supply chain. Whilst the robust induction seal allows product to be distributed via an e-commerce packaging strategy, eliminating leakers and ensuring that the contents arrive factory fresh to its ultimate destination.

MEYER® since 1879 Seals

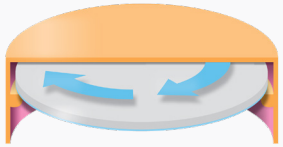
ALKOseal™ two-piece induction liner

When looking for an extra layer of protection for your product, induction liners are a great solution that can easily be incorporated into the closure design. The composition and laminate structure of your induction liner will mostly depend on your product's contents.

ALKOseal™ induction liners are hermetic air-tight seals located on the top rim of a plastic or glass containers that is bonded into place using electromagnetic induction heat and incorporates a secondary re-seal liner that continues to protect the contents from moisture and oxygen ingress after the consumer has opened the product.

ALKOseal™ range of two-piece liners are designed to achieve a clean peel hermetic seal on containers, protecting the contents against undesirable environmental influences 'prior' and 'post' opening.

ALKOseal™ induction liners rotate freely behind a retention feature that is incorporated into the bottom of the closure. (See page 42 for more details.)



ALKOseal™ secondary re-seal can be made from the ALKOzell™ range of products either expanded Polyethylene (EPE) or expanded Polypropylene (EPP) or food grade virgin paperboard. The secondary re-seal remains in the closure and protects the contents when re-sealed.

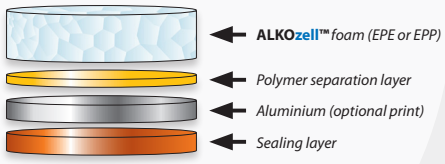
When a container that is sealed with **ALKOseal™** is opened, it produces a highly audible opening sound - a clear signal from the brand owner to consumers that the product is authentically protected, factory fresh, and has not been tampered with.

ALKOseal™ withstands warmer climatic conditions due to a temperature-resistant extruded polyolefin-based film.

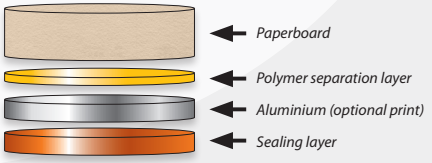
ALKOseal™ is available as pre-cut discs or in slit width tape.

When induction sealing **ALKOseal™** to a glass container, the surface of the glass container will not melt and combine with the heat-seal substrate, therefore these liners will only be a peelable seal. Unlike when sealing to plastic containers where the land area of the rim of the container will melt during the induction process, offering either a peelable or a true weld hermetic seal if required.

ALKOseal™
Composition



ALKOseal™
Composition



The composition of **ALKOseal™ glasSecure™** with either an EPE or EPP secondary re-seal liner is the world's first fully recognised recyclable induction liner, with the secondary EPE or EPP being fully compatible with the closure material construction, by marrying up these plastics compatibilities between the secondary re-seal liner and the closure resulting in a mono material that negates the need for post-consumer waste segregation. The primary induction seal that is removed by the consumer, being aluminium foil that can be recycled alongside aluminium beverage cans, which has been approved by the European interseroh zero waste solutions.

ALKOseal™ differentiated two-piece induction liner

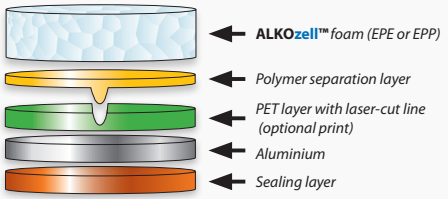
ALKOseal™ mono™ induction sealing liner is EU and FDA food contact compliant, and its recyclability has been tested and approved with Interseroh zero waste solutions, who offer a highly efficient way of sorting lightweight packaging and mixed recyclable-materials for customers across Europe. ALKOseal™ mono™ has replaced the traditional use of paper-board-backed reseal liners used as a secondary re-seal during the induction sealing process, and thereby eliminates the need for post-consumer waste segregation of the caps and closures.

ALKOseal™ pierce 'n' peel™ is the sealing liner with a bespoke laser cut line - which can be individually designed – and ensures an intuitive and extremely convenient opening process. The unique bespoke laser cut line can be adapted in size and shape according to the application requirements; for example, a dosing opening is possible for measured dispensing of the filling contents. This means that both brand owners and consumers enjoy complete flexibility in handling.

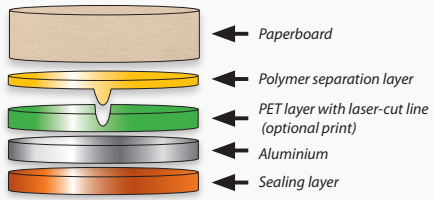
ALKOseal™ glasSecure™ is designed for induction sealing of aggressive products containing oil and grease in glass containers. These products used to pose a major challenge, the high seal strength of ALKOseal™ glasSecure™ ensures reliable protection even at warmer temperatures and resists pressure fluctuations. ALKOseal™ glasSecure™ is free from MOSH (Mineral Oil Saturated Hydrocarbons) and MOAH (Mineral Oil Aromatic Hydrocarbons) and complies with the foodstuff regulations of the EU and FDA (U.S. Food & Drug Administration).

ALKOseal™ agroSecure™ is a chemical resistant two-piece induction seal that does not require wax to bond the primary-foil to the secondary re-seal liner. Incorporating a Polyolefin bond instead of wax eliminates the potential problem of transportation and storage delamination due to high ambient temperatures. In addition utilising a EPE/EPP secondary re-seal liner eliminates any board fibre dusting issues and gives a more sustainable product as the secondary re-seal can be manufactured to suit the closure material ensuring easy recyclability.

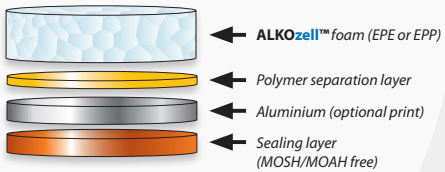
ALKOseal™ pierce 'n' peel
Composition



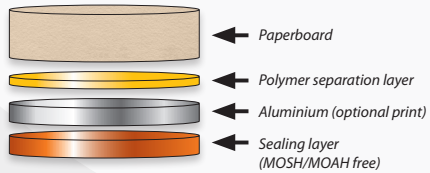
ALKOseal™ pierce 'n' peel
Composition



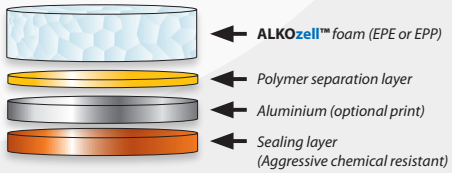
ALKOseal™ glasSecure™
Composition



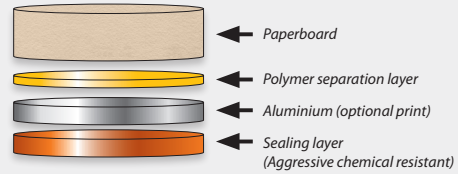
ALKOseal™ glasSecure™
Composition



ALKOseal™ agroSecure™
Composition



ALKOseal™ agroSecure™
Composition



ALKOsafe™ two-piece induction liner

ALKOsafe™ is Meyer Seals® range of two-piece, wax-laminated liners for induction sealing for both plastic and glass containers.

The two-piece laminated structure is securely held together throughout the supply chain and separates upon demand, into a robust hermetic primary seal secured to the land-area of the container and a secondary re-seal that is firmly located into the base of the closure when activated by the induction sealing process.

The re-seal part can be either board or ALKOzell™ foam, as required, and provides a reliable secondary re-seal even after removal of the hermetic seal.

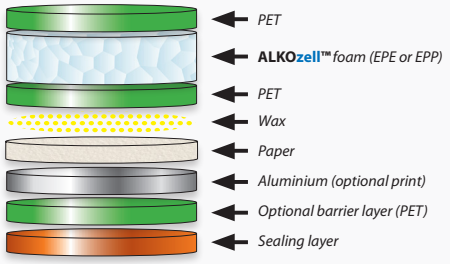
ALKOsafe™ is available as pre-cut discs or in a reel format. Meyer Seals® offers ALKOsafe™ induction sealing liners with multicolour printing. Whether it is instructions for product handling, brand logos or promotional brand marketing messages, the ALKOsafe™ sealing liner becomes an important part of communication between the brand owner and the consumer.

ALKOsafe™ wide range of barrier films and re-sealing materials is ideal for all applications. From protection against oxygen ingress, moisture or highly resilient to aggressive products and hazardous container contents, ALKOsafe™ is approved to UN (United Nations) international standards.

ALKOsafe™ induction sealing liners can be provided with individual holograms, embossing, multi-coloured printed and special covert, overt and forensic anti-counterfeit markers, to meet the demand for increased protection against counterfeiting of high-value branded products.

ALKOsafe™ can be a True-Weld seal for a container having a sealing surface made of a material that is compatible with the land area of the container. This gives a very strong and destructive seal. True Weld means that when the liner is broken, the foil structure cannot be completely cleared from the land area. ALKOsafe™ peel-able refers to the liner being able to be peeled cleanly away from the land area of the container.

ALKOsafe™
Composition



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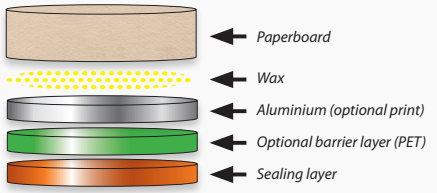


Anti-counterfeit markers incorporated into print

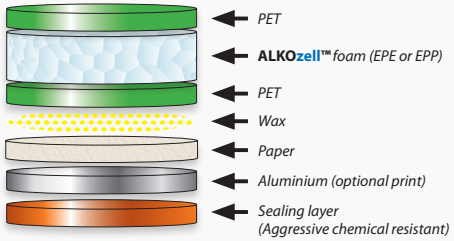
ALKOsafe™ agroSecure™ differentiated two-piece induction liner

ALKOsafe™ agroSecure™ is Meyer Seals® range of two-piece, polyolefin bonded PE liners for induction sealing to polyethylene plastic containers.

The foil structure of **ALKOsafe™ agroSecure™** has a strong chemical resistant heat-seal layer, with a large induction sealing window that has no hygroscopic tendencies.

ALKOsafe™ agroSecure™					
	OIL Olive Oil, Motor Oil	**SOLUTION** 1% Acidic Acid 0.33% Citric Acid 0.33% (NaCl) Sodium Chloride	**SOLVENT** Iso-Propanol	**SOLVENT** Ethyl-Acetate	**SOLUTION** 10% (HCl) Hydrochloric Acid
Chemical Characterisation	Fatty Oil	Simulant for Acidic Food	Organic Solvent	Strong Organic Solvent	Strong Mineral Acid
Typical industrial formulation	Edible & Motor Oils	Mixed pickles, fermented cabbage	Disinfectants, automotive additives (anti-freeze)	Colours, chemical intermediates	Water conditioners, chemical intermediates
Test Conditions	Elevated temperatures 40˚C for 4 weeks				

ALKOsafe™ agroSecure
Composition



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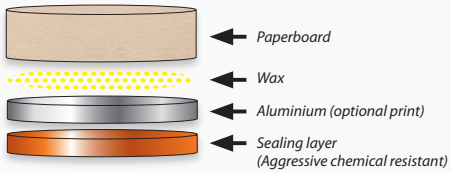

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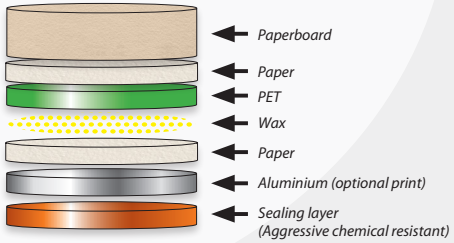


Some of the key benefits to ALKOsafe™ agroSecure™:

- Greater chemical resistant to extreme Ph levels both Alkaline and Acidity.
- Better heat-sealing resistance in high humidity weather conditions.
- Revolutionary heat-seal gives a bigger induction sealing window.
- Reduction in laminated structure gives a greater environmentally sustainable induction liner.

ALKOflex™ one-piece induction liner

For containers where a secondary re-seal is not necessary, **ALKOflex™** is a one-piece induction liner where there is a high degree of user-friendliness, thanks to the smooth peel and ease of removal.

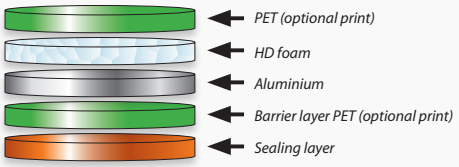
Well-known brand owners of dairy, condiments, beverages, herbs, spices, and a variety of other products value the reliable protection afforded by this hermetic sealing liner. Both plastic and glass containers utilise **ALKOflex™** peelable sealing solutions.

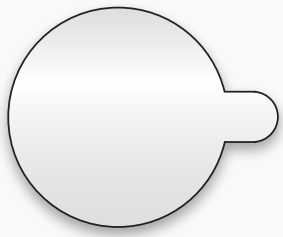
ALKOflex™ can be punched with small tri-tabs, quad tabs, super tab or a single pull-tab that help retain the liner within the closure and facilitate the easy peel when the consumer removes it from the container.

Both the flavour and aroma of the filling contents is optimally preserved by preventing oxygen ingress with a layer of aluminium encapsulated into the laminated structure of the **ALKOflex™** induction liner.

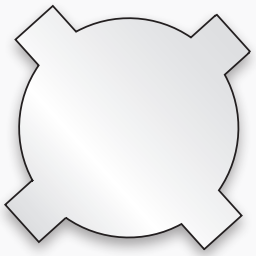
ALKOflex™ range of one piece induction seals provides positive production benefits with a wide induction operating window. ALKOflex™ is available in both peel-able and as a True-Weld product. If required, ALKOflex™ is available with custom promotional prints, trademark or brand logo's which can be printed on either the sealing surface or on the visible top surface according to the brand owners requirements for product differentiation.

ALKOflex™
Composition

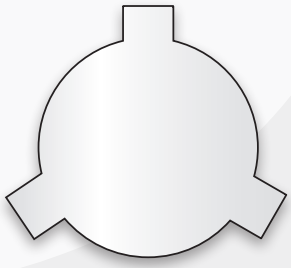




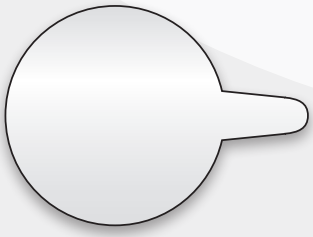
Pull tab



Quad tab



Tri tab



Super tab

ALKOflex™ tab™ differentiated one-piece induction liner

ALKOflex™ tab is an innovative hermetic induction sealing liner developed by Meyer Seals® which offers the perfect user-friendliness. It is equipped with a large grab tab that can be customised in terms of its size, colour, and shape, making it safe, simple, and convenient to use.

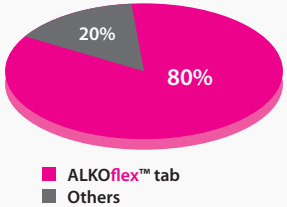
What makes **ALKOflex™ tab** different from other one-piece induction liners is the large consumer friendly tab which does not contain any aluminium. This unique feature improves the induction process, as the high-frequency eddy current is not deflected from the remaining circular aluminium structure of the sealing liner.

Eliminating the aluminium in the large grab tab prevents the creation of "hot" and "cold" spots during the sealing process that can lead to failure of the hermetic seal.

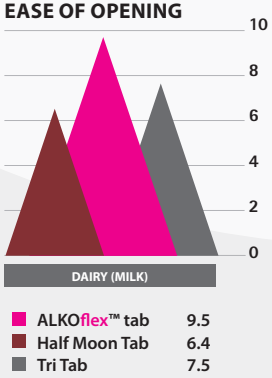
The outstanding ergonomics of **ALKOflex™ tab** have been confirmed by extensive qualitative market research with end consumers across all age groups.

Meyer Seals® **ALKOflex™ tab** is easy for children to use, as well as individuals with limited hand mobility and the differentiated colour assists consumers with visual impairments.

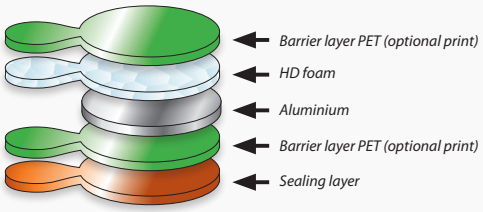
OPENING PREFERENCE



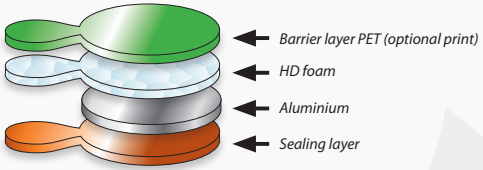
EASE OF OPENING

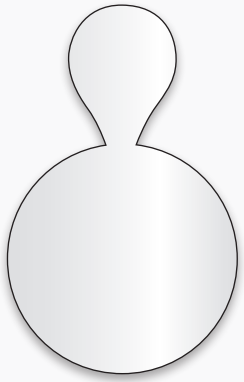


ALKOflex™ tab
Composition

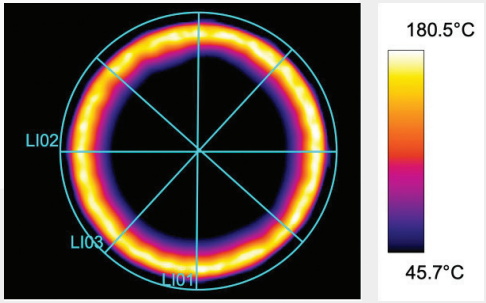


ALKOflex™ tab
Composition





Differentiated large grab tab



ALKOflex™ tab Induction
The large grab tab does not deflect the eddy currents during the induction sealing process

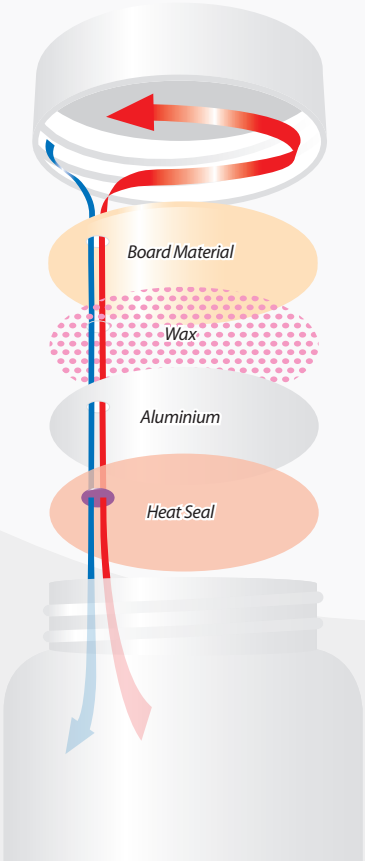
ALKOvent™ safe™ induction venting liners

ALKOvent™ safe™ belongs to the product group of technical induction seals. The container is securely sealed while allowing the contents to "breathe" a bi-directional gas. The pressure equalisation system offers a customised venting solutions for every day.

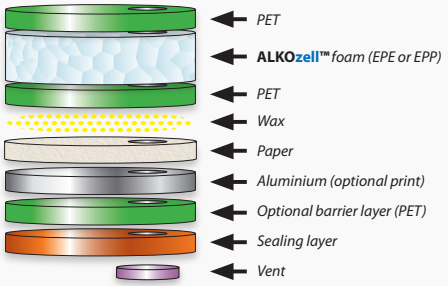
ALKOvent™ safe™ is used with agrochemicals, household cleaners and food supplements. ALKOvent™ safe™ provides a unique value that allows bi-directional gas exchange through a liquid-tight but gas-permeable membrane. This effectively prevents any "bloating" or "panelling" distortion either of the container due to a vacuum or excessive overpressure.

The **ALKOvent™ safe™** membrane is applied in-house at Meyer Seals®. Deformed containers on retail shelves diminish consumer confidence in the quality of the product, meaning the product unfortunately becomes a shelf warmer. With ALKOvent™ safe™ this problem is a thing of the past.

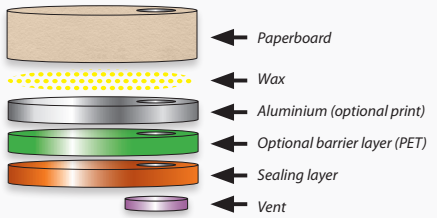
The use of **ALKOvent™ safe™** induction sealing liners eliminates the need for pressure-stable, thick-walled, and consequently heavy containers and closures. Both the container and the closure thicknesses can be significantly reduced, meaning the use of less materials and the conservation of valuable resources. ALKOvent™ safe™ induction sealing liner makes a significant contribution to long-term sustainable solution and value creation.



ALKOvent™ safe
Composition



ALKOvent™ safe
Composition



- Induction applied with heat seal face PE/PP/PET two-piece liner with either a carton board or EPE secondary
- The vent is placed off-centre in the liner to allow glue to retain the secondary in place
- Free flow of gas is through the thread of the closure

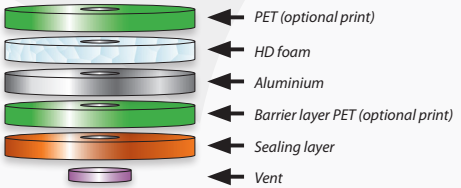
Deformation caused by unequal pressure

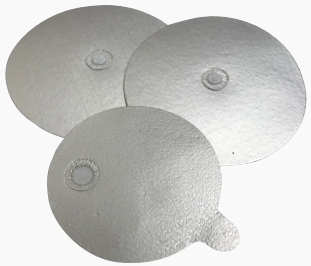
ALKOvent™ equalises pressure inside containers

ALKOvent™ flex™ induction venting liners

ALKOvent™ flex™ part of the group of technical induction seals. As a one-piece liner the container is reliably sealed while allowing the filling substance to "breathe" via a bi-directional gas exchange. The pressure equalisation system offers a customised venting solutions for every day.

ALKOvent™ flex
Composition





WHAT CAUSES A CONTAINER TO DISTORT AFTER FILLING?

Contents that contain bleach, oxidizing agents and other gaseous components can cause 'bloating' and potentially burst the container.

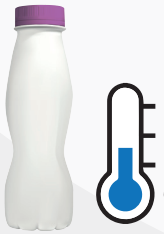
Contents which contain solvents or oils absorb oxygen thus causing 'panelling/ collapsing' of the container.
Hot filled product (38° to 83°C / 100° to 180°F) will shrink when cooled causing the container to 'panel/collapse' if the container is sealed prior to cooling.

Releasing Gases

Consuming Gases

Falling temperatures can cause under-pressures and collapse, extreme temperature changes accelerate container deformations.

Rising Temperatures



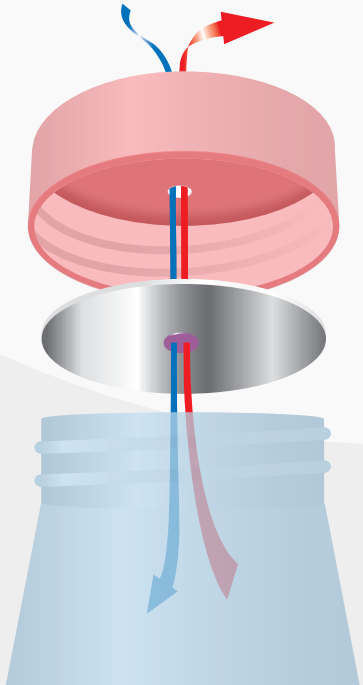
Falling Temperatures

Altitude changes create pressure differences. Increasing altitude creates over-pressure within the container, leading to bloating. Decreasing altitude creates under-pressure, causing the container to collapse.

Increased Altitude

Decreased Altitude

ALKOvent™ flex™ unique vent equalises pressure within the container from both high surface tension hydrophobic liquids as well as low surface tension oleophobic liquids. ALKOvent™ flex™ ensures the consumer has tamper evident packaging that allows the product contents to breath without leaking.



MEYER since 1879 Seals

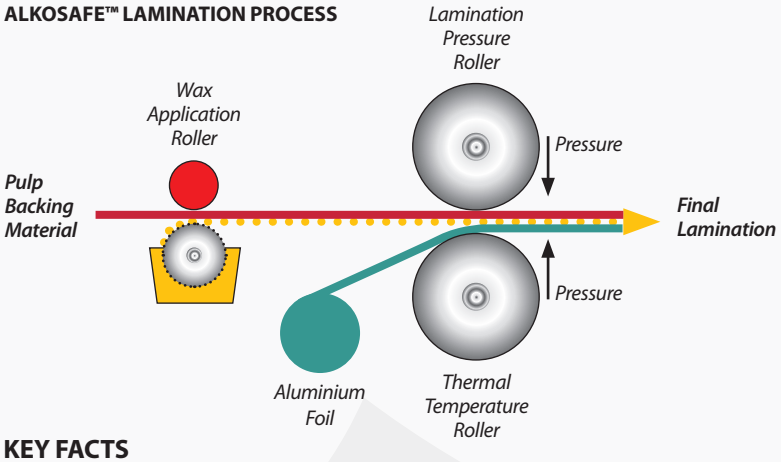
Liner Separation Methods

With two piece liners, there are two recognised forms of separation:

WAX SEPARATION

ALKOsafe™ has a heat-seal sealant material on the primary foil which bonds as either a peelable or a true weld to the land area of the container, simultaneously the wax melts and gets absorbs into the backing material or into the paper on the foil. Wax being the bonding layer between the primary seal and the secondary re-seal wad. Both parts separate during the heat of the induction sealing process, with the secondary lining material remaining permanently in the cap.

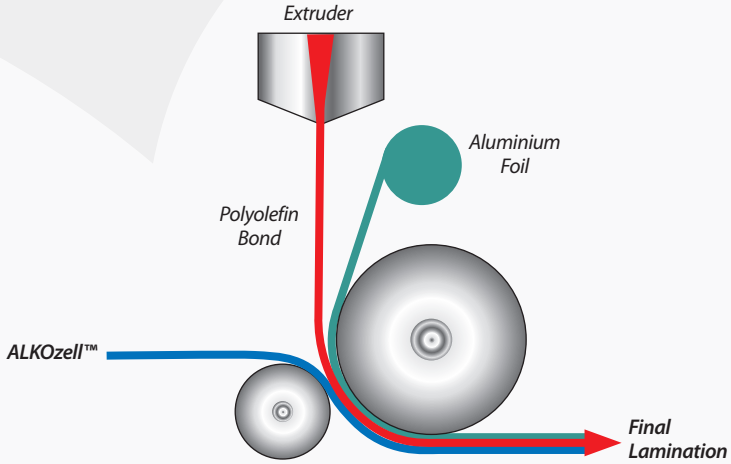
ALKOSAFE™ LAMINATION PROCESS



KEY FACTS

- The GSM (grams per square metre) of wax that is applied is dependent on the product application and meets the process performance criteria
- Wax is applied either as a flood coating or via rotogravure process
- Transportation temperature range can be tailored dependent on the ultimate climate conditions in conjunction with the designated region up to 35°C

ALKOSEAL™ LAMINATION PROCESS



POLYOLEFIN SEPARATION

ALKOseal™ permanently withstands warmer climatic conditions during transportation and storage due to a temperature-resistant polyolefin-based laminating film. Filling contents are superbly well protected across the entire supply chain. When a container sealed with a Polyolefin bond is opened, it produces a highly audible opening sound - a clear signal from the brand owner to consumers that they have purchased a factory fresh product that has not been tampered with.

KEY FACTS

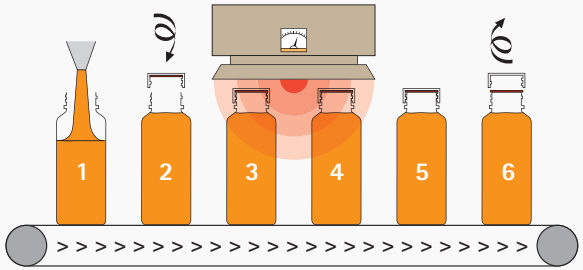
- There is a targeted range of the Polyolefin bond strength which is dependant on the product application and most importantly the performance functionality
- The secondary re-seal liner can either be board based or polymer based EPE or EPP
- The ALKOseal™ liner must be sized and inserted into the closure correctly to ensure free rotation of the liner behind a fixed retention feature located in the closure

What are the two induction cap sealing processes?

There are two recognised methods of induction sealing a hermetic induction foil onto the rim of the container neck profile:

NON-CONTACT INDUCTION SEALING

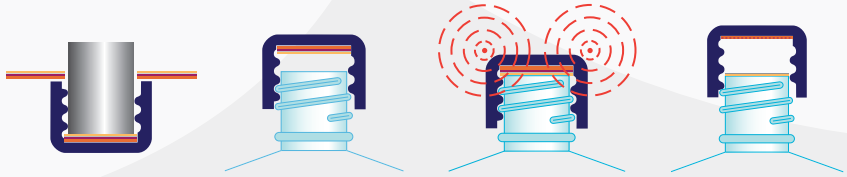
This process takes place after the container has been filled and then capped with a closure that contains an induction foil that is located in the base of the closure. This is known as a non-contact method of induction sealing as the container passes independently under an induction coil which emits an oscillating electro-magnetic field. As the container passes under the induction coil (also referred to as a 'sealing head') the aluminium foil that is encapsulated in the laminated structure of the induction liner, heats up due to Foucault's currents (eddy currents) according to Faraday's law of induction.



NON-CONTACT INDUCTION PROCESS STAGES

1. *Filling*
2. *Capping with correct on-torque (PRESSURE)*
3. *Product transported on speed controlled conveyor (DWELL)*
4. *Induction Period (TIME)*
5. *Cooling*
6. *Sealed Container*

JOURNEY OF A NON-CONTACT INDUCTION SEALING LINER

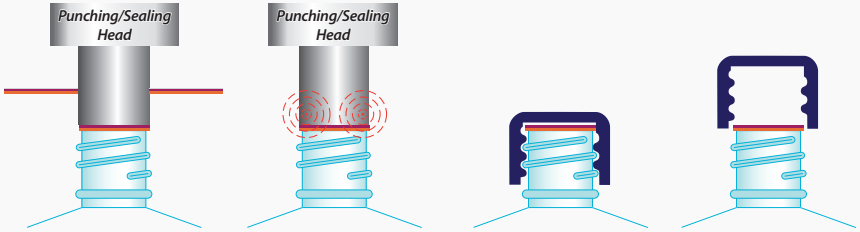


1. *Punching / inserting liner*
2. *Capping with correct on-torque*
3. *Induction*
4. *Sealed container ready for use*

DIRECT INDUCTION SEALING

This process takes place after the container has been filled and a specific diameter ceramic punch cuts through the induction foil, which in turn is immediately held in place with a vacuum. The ceramic punch then accurately places the foil onto the rim of the container all in a single action. The induction cycle is then activated and the aluminium in the induction foil is heated up hermetically sealing the induction liner onto the container. The closure, if still required, is fitted after the induction sealing process is completed.

JOURNEY OF A DIRECT INDUCTION SEALING LINER



1. *Punching / positioning liner*
2. *Induction*
3. *Capping*
4. *Sealed container ready for use*

BENEFITS OF DIRECT INDUCTION SEALING

- Real time digital control over induction power level (temperature)
- Exact control of induction cycle time
- Precise control of sealing pressure via sealing head - compliant rubber sealing surface
- Ability to maintain pressure on foil during 'cooling' phase
- Measurement of induction power on each seal possible =100% QA validation
- Allows use of thinner aluminium structures

Getting the balance right ‘Pressure’ / ‘Heat’ / ‘Time’

Both methods of induction sealing need to ensure the following three elements to obtain a good seal.

PRESSURE

Pressure is needed for the liner to have an even seal to the container. This is achieved by either the torque heads of the capper or the top pressure from the ceramic cutter. There are a number of factors that contribute to pressure.

The closure in relation to the container’s neck profile (‘non-contact sealing) / ceramic punch diameter to the container neck profile (‘direct sealing’) to maintain the required pressure onto the rim of the container this is measured in either inch pounds (in-lb) or Newton meters (Nm).

HEAT

Setting up the induction sealer power to the correct performance parameters will generate the optimum amount of heat. There are three important areas to consider to produce a correct seal of the liner to the rim of the container:

- The power (energy) setting on the induction equipment.
- The distance (air gap) of the induction sealing head to the aluminium foil laminated into the induction liner.
- Choosing the right profile of the induction coil for the job, ie a flat coil or a tunnel coil.

TIME

The time for the closure to pass under the induction coil is called the dwell time. The induction seal liner needs sufficient time under the coil to be heated to the correct temperature for the sealing surface to melt and bond to the land area of the container.

Soluble melting bonds such as ‘wax’ that can be found in some two-piece induction liners, may require more time for the wax to be absorbed into the white lined pulp, especially on larger diameters. The time that the closure/container spends under the induction coil is determined by the conveyor speed.

Understanding the 'process' of Induction Sealing

When the aluminium foil is intersected by electromagnetic lines of force, a current is caused to flow in the aluminium disc. It is the friction caused by the current flow that causes the aluminium to heat up. These currents are known as eddy currents.

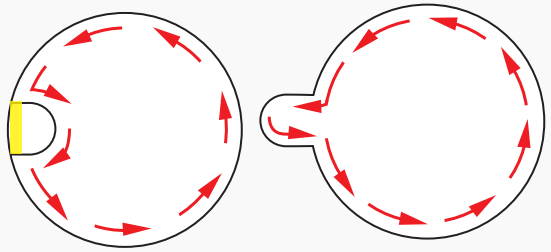
The higher the frequency, the increased level of eddy currents that tend to flow to the outside edge of the laminated structure. If the eddy currents are too high the outside edge of the aluminium foil can be damaged.

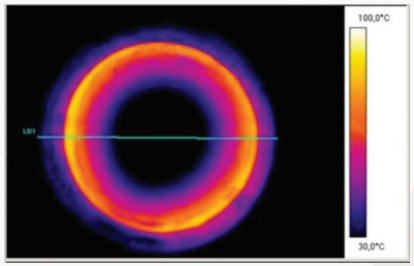
At the same time, any heat reaching the centre of the disc must do so by conduction that is caused, by thermal transfer through the aluminium foil. The conductive heat through the aluminium foil is considerably slower than the direct induction caused by the eddy currents. Therefore, by the time the conductive heat reaches the middle of the aluminium foil, the edges of the laminated structure can be damaged. This is particularly more prevalent in closures larger than 38mm in diameter.

Heat transfer effect

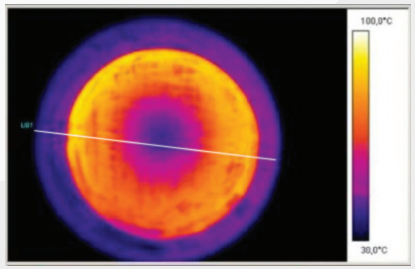
The shape of the pull-tab liner can influence the high-frequency eddy currents that tend to be attracted to the edge of the liner. When the liner is inserted into the closure and the tab is folded back, the high frequency tends to continue to follow the edge of the liner.

Currents tend to follow the outside edge of a pull-tab, which can result in a weak seal where tab is folded back.





One piece Liner induction heat signature
For the ALKOflex™ and ALKOseal™ range of induction seals a heat signature is only required around the circumference of the container.



Two piece Liner induction heat signature
To enable complete wax absorption into the pulp board or paper layer It can clearly be seen that the heat energy is dissipated quite widely across the foil, this enables a wax bond to melt correctly.

Understanding the container as a 'heat sink'

The container acts as a heat sink. This means that the when liner is induction sealed the liner at temperatures around 600°F / 315°C with sufficient pressure to the land area, the container absorbs heat via conduction from the induction seal liner.

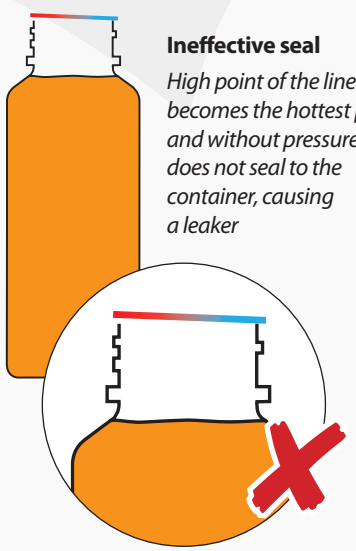
Insufficient liner pressure and/or uneven pressure on the land area will result in poor seals. If the liner is not held evenly around the entire circumference of the container, the areas that are not firmly under pressure will not dissipate the heat away and that area will overheat. Due to the overheating of the liner, the land area on the container would suffer excessive meltdown, which in turn would cause more uneven pressure.

THINGS TO LOOK OUT FOR:

The heat sink effect can be influenced by the fill level (flood filled containers) and increased temperature (hot fill).

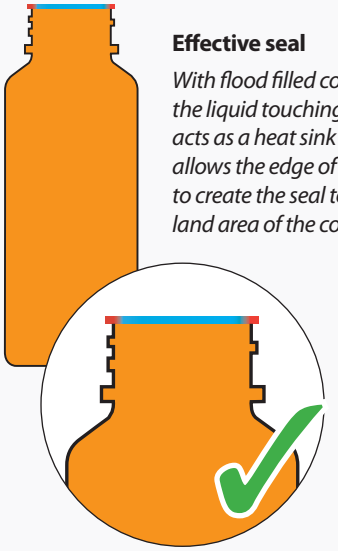
The induction field (eddy currents) does not influence the aluminium foil that is in a vertical position when passing under the induction coil. In some cases with the tabs folded down, the induction field gets deflected so the liner in that area sees less heat and can create cold spots. Round corners on the individual tabs tend to deflect less eddy currents than square corners on tabs.

If you have a large portion of the liner folded over the edge of the container, this can have a cooling effect on the part of the liner that is on the land area and may produce weak seals or leaks.



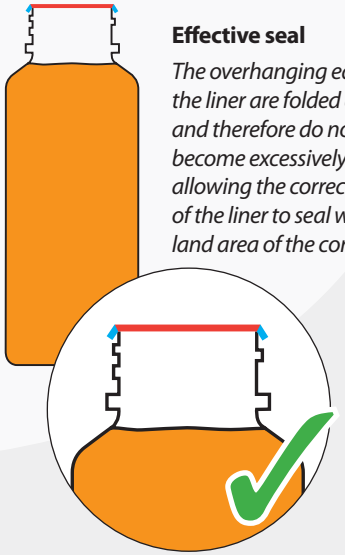
Ineffective seal

High point of the liner becomes the hottest part and without pressure does not seal to the container, causing a leaker



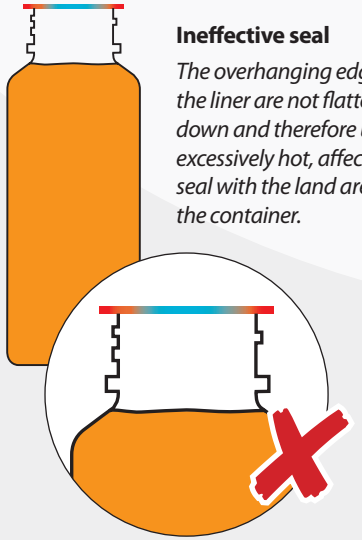
Effective seal

With flood filled containers, the liquid touching the liner acts as a heat sink and allows the edge of the liner to create the seal to the land area of the container.



Effective seal

The overhanging edges of the liner are folded down and therefore do not become excessively hot, allowing the correct part of the liner to seal with the land area of the container.



Ineffective seal

The overhanging edges of the liner are not flattened down and therefore become excessively hot, affecting the seal with the land area of the container.

Understanding the 'air gap' in the sealing process

Although it is called an 'air gap' the correct definition is the distance from the underside of the induction head to the aluminium foil as this is the distance the radio frequency energy has to be transmitted.

As closures come in all different sizes and shapes, and understanding the position of the induction foil in the closure can be difficult, visualising and maintaining a consistent visible air gap between your induction head and the top of your package's closure is easier for operating staff.

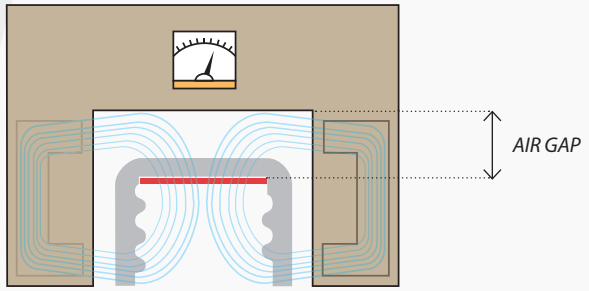
Regardless of the distance, the most important aspect is that each time you set your machine up, it is consistent between each run. Keep in mind that the distance between the sealing head impacts the power level set on the induction cap sealing machine. More power is requires to seal an induction foil with a greater air distance.

With tall closure (often found in the beverage industry with drinking spouts) a tunnel coil is recommended.

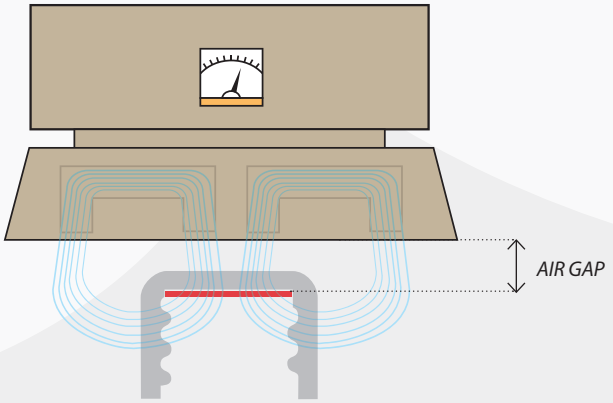
Closures must be centred on the conveyor and in the centre of the induction head. The induction sealing head must be parallel to the top of the closure and conveyor in all directions.

Some sealing heads have been constructed to be positioned diagonally to the conveyor and the closure, it is also important to ensure that this style of induction equipment is set equally at the correct position.

TUNNEL INDUCTION COIL



FLAT BED INDUCTION COIL



Calculating the 'on torque' of closures

A key variable in the induction cap sealing process is the level of on-torque applied to the closure (pressure). There are two types of torque to be aware of application torque (Induction centric) and removal torque (Consumer centric). In non-contact induction sealing, the closure is the main tool for applying uniform pressure onto the induction liner to achieve the proper seal. This is why it is so important to have the proper on-torque.

Simple Calculation

Use one-half the diameter in mm of the closure for In-lbs of on-torque.

Application Torque = 38mm closure = 19 In-lbs.
Removal torque = 38mm closure = 9 In-lbs

Every time you heat an induction seal, you are shrinking the overall height of the liner, therefore releasing the level of application pressure. The heat seal layer will compress as it begins to flow & adhere to the land area of the container. Secondly, if you are using a two-piece liner with a wax release layer, the wax is absorbed into the pulp board secondary liner, again creating a shrinkage in the overall height of the liner.

Additionally to the shrinking of the overall height of the liner the whole system (cap, jar, liner) will relax by heat generated by the induction sealing due to characteristics of the plastic material

Application Torque Guide (measured in units inch/lbs)		
CAP SIZE (MM)	**PLASTIC CONTAINER**	**GLASS CONTAINER**
15	7-9 in/lbs	6-9 in/lbs
18	8-10 in/lbs	7-10 in/lbs
20	10-12 in/lbs	8-12 in/lbs
22	11-14 in/lbs	9-14 in/lbs
24	12-15 in/lbs	10-15 in/lbs
28	13-17 in/lbs	11-17 in/lbs
33	16-20 in/lbs	13-20 in/lbs
38	19-23 in/lbs	15-23 in/lbs
43	21-26 in/lbs	17-26 in/lbs
45	23-28 in/lbs	18-28 in/lbs
48	24-29 in/lbs	19-29 in/lbs
53	27-32 in/lbs	21-32 in/lbs
58	29-35 in/lbs	23-35 in/lbs
63	31-38 in/lbs	25-38 in/lbs
70	35-42 in/lbs	28-42 in/lbs
83	41-49 in/lbs	34-49 in/lbs
89	44-53 in/lbs	36-53 in/lbs
100	48-60 in/lbs	40-60 in/lbs
110	55-65 in/lbs	45-65 in/lbs
120	60-72 in/lbs	48-72 in/lbs

Note:
opening torque will vary when it comes to different combinations of materials

MEYER since 1879 Seals

Understanding the 'Dimensional' relationship between the induction liner and the closure

The induction liner and the closure design is a single system in which the dimensions and properties of both components are important for the system to function correctly.

Four parameters have to be considered when assessing the suitability of closures to provide satisfactory performance with ALKOseal™:

LINER CLEARANCE - In the use of ALKOseal™ it is important that the liner rotates freely within the closure to ensure satisfactory separation. The liner clearance i.e. Liner Recess Ø II minus Liner Ø I. This should be typically 0.30/0.40 mm for 50g closures and 0.50 mm for larger Ø closures.

Liner Clearance (mm) = II (mm) – I (mm)

INTERFERENCE FIT - The second consideration for satisfactory separation is the Interference Fit between Liner and Liner Retention Bead i.e. Liner Ø I minus Ø of Liner Retention Bead III. This parameter increases with increasing closure size e.g. 1.10/1.20 mm for 50g closure, 1.20/1.40 mm for 100g closure and 1.60/1.80mm for 200g closure.

Interference Fit (mm) = I (mm) – III (mm)

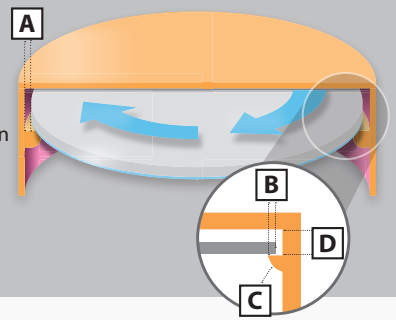
RETENTION BEAD PROFILE - With regard to the Retention Bead Profile, ideally this should be quadrant shaped on top and flat underneath to minimise insertion damage and to resist wad pull-out. The ends of the bead should be squared not tapered, to avoid the wad jamming on the tapered bead, causing the membrane to separate by shear rather than by a lifting action.

HEIGHT OF RETENTION BEAD FROM THE CLOSURE BASE - The recommended height of the Retention Bead from the base of the closure is 2.50 mm to allow complete insertion with minimum damage.

CLOSURE DIMENSIONS - ALKOseal™

These parameters have to be considered when assessing the suitability of closures to provide satisfactory performance with ALKOseal™

- **A** LINER CLEARANCE - to allow rotation
- **B** INTERFERENCE FIT - to ensure retention
- **C** RETENTION BEAD PROFILE - to minimise damage on liner insertion and ensure retention
- **D** HEIGHT OF RETENTION BEAD FROM CLOSURE BASE – to allow complete insertion with minimum edge damage



It is important that the liner rotates freely within the closure to ensure satisfactory separation.

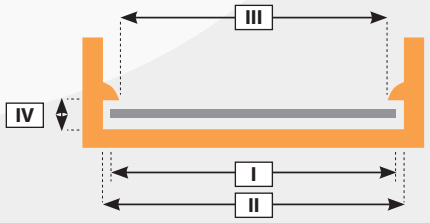
Liner clearance ensuring free rotation of the liner = 'B' is smaller than 'A' (mm)

Interference fit ensuring liner retention = 'A' is larger than 'C' (mm)

Free float separation ensuring liner can move during separation = 'B' (mm)

It is critical that this dimensional relationship between the induction liner and the closure is adhered to, a lack of free rotation will lead to both 'wad-pull-up' or 'wad-pull-out'. In addition incorrect off-centre placement of the induction liner into the closure with affect the hermetic sealing capabilities (see section on induction sealing problems).

Examples of Cap Diameter Recess			
	52mm	**63mm**	**81mm**
Interference Fit	1.10 / 1.20 mm	1.20 / 1.40 mm	1.60 / 1.80 mm
Liner Clearance	0.30 / 0.40 mm	0.50 mm	0.50 mm



I - *Liner Ø*
II - *Recess Ø*
III - *Retention Bead Ø*
IV - *Retention Bead Height*

Ø = Diameter

Dimensional relationships between closure and innerseal

Setting up a non-contact induction sealer

Check that the guides either side of the transportation conveyor that is running under the induction coil are correctly set, so that they control the flow of the containers without causing them to skid or slip on the moving conveyor or the container remains stationary under the induction coil.

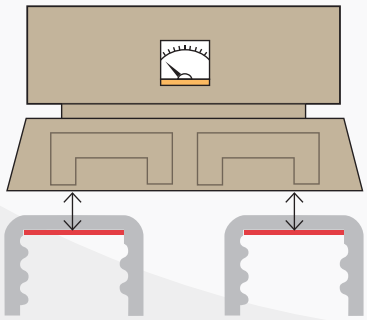
Ensure that the conveyor speed is constant and that the speed does not vary with and without filled production.

Ensure your induction sealing head is aligned centrally to the conveyor. Sealing head positioning is critical to successful sealing. The power of the electromagnetic field reduces by the square of the distance, meaning that if you double the distance between the ALKOflex™ / ALKOseal™ / ALKOsafe™ / ALKOvent™ liner and the induction head you only have a one quarter (1/4) of the sealing power.

The optimal distance between the sealing head and the closure is on average between 4mm – 8mm. The container/closure must be central to the induction head at either end (tunnel or flat bed). In addition, the sealing head must be parallel (equal distance in height) with the conveyor belt, providing even heating throughout its length.

When the equipment is turned off, an easy shortcut can be achieved by placing a capped container under each end of the induction head and adjusting the air gap to maintain equality at both ends.

Set the conveyor speed at a small percentage (%) that is above the filling line speed, the production line should always be pulling the containers away from the filler.



Check for consistent and correct air gap below the induction head

Ensure that the land area of the container top (induction sealing area) is reasonably free of burrs, flashing and flat.

Ensure that the closures are properly torqued on to the container by applying adequate force to ensure the pressure evenly seats the induction liner onto the rim of the container. (See page 35 for more details about on-torques).

The induction unit and the kilowatt (kW) rating of the coil is the correct size for the closure.

Start with the induction equipment set at minimum power, run a single container underneath the induction sealing coil. Check the container for a seal, if it partially sealed, use a new bottle, repeat this test increasing the energy levels with a 1-2% power adjustments until you have a complete seal across the entire container face. Make note of the energy settings this is the bottom of the operating window.

Continue to increase the energy levels with again a 1-2% adjustment until the induction seal shows levels of scorch (burning). Make note of the energy settings this is the top of the operating window.

The correct energy setting is the middle energy value between the recorded bottom energy setting and the top energy setting.

With the induction sealing equipment set at the middle value of the operating window, run a tightly grouped number of filled containers in-line, which completely occupies the full length underneath the induction sealing head. This will test the power load requirements of the induction equipment.

Record induction power level settings, line speed, and closure type for future reference. Do this for all the various types of closures and containers used.

Although there are no industry standards for measuring induction seal integrity, there are several ways to assess seal quality. This can be assessed by subjecting the sealed container to a firm hand squeeze, for a more technical measurement using a vacuum testing and recording the pascal (Pa).

Setting up the induction operating window

GOOD SEAL

- *Full hermetic seal on primary foil*
- *Full absorption of the wax into secondary re-seal*

NO SEAL

- *Insufficient energy during induction sealing, no sealing of primary seal*
- *No separation between primary foil and secondary re-seal*
- *Induction liner remains located inside the closure*

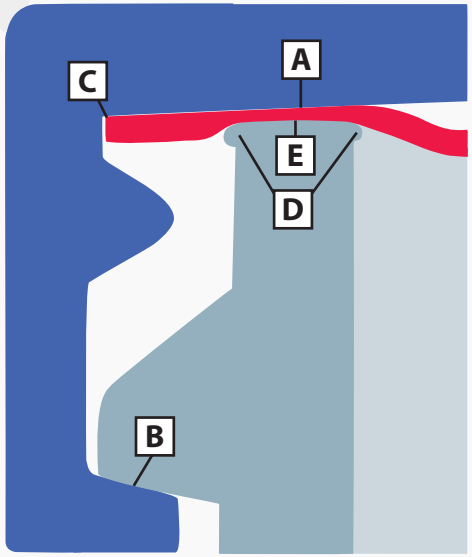
PARTIAL SEAL

- *Requires more energy during induction sealing process*
- *Primary induction foil not fully hermetically sealed on container*
- *Wax not fully absorbed into secondary re-seal*

OVERHEATED SEAL

- *Too much induction power applied*
- *Too much time under induction sealer*
- *Scorch marks on both primary induction foil and secondary liner*

Example of a good induction seal



Observations

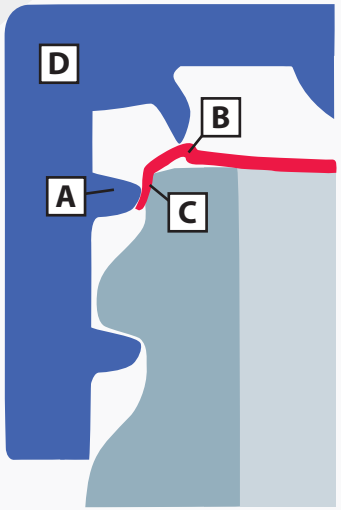
- **A** Good pressure from closure on liner
- **B** Good thread contact
- **C** Liner fits evenly in closure
- **D** Good meltdown on land area
- **E** Liner is compressed by container

Trouble Shooting Guide

Induction Sealing Problems		
FREQUENCY	**PROBLEM**	**ROOT CAUSE**
PERSISTING	Fail to seal	Improper sealing parameters (Air gap to large / conveyor speed to fast / sealing energy too low / conveyer & induction head not in line) Wrong combination of container material and liner sealing-layer Closure pressure insufficient due to closure / container design (Closure bottoming on container) Closing on-torque too low
PERSISTING	Partially Sealed	Container not centred correctly under the induction head Container rim (land area) not flat and parallel to the liner Container rim (land area) not smooth Container rim (land area) either wet or contaminated with product Insufficient closure pressure on full circumference of the rim (land area Conveyer & induction head not in line (off centre)
PERSISTING	Burns on the film	Improper sealing parameters (Air gap too small / conveyor speed too slow / sealing energy too high)
PERSISTING	Hard to open two-piece induction seal due to wax residue remaining	Sealing energy too low Conveyor speed too fast Air gap distance too large

Induction Sealing Problems		
FREQUENCY	**PROBLEM**	**ROOT CAUSE**
OCCASIONAL	Partially sealed	Wrong closing on-torque Container rim (land area) not flat Container rim (land area) not smooth Container rim (land area) either wet or contaminated with product Incompatibility between the threads on the container and the threads inside the closure High levels of flashing (parting lines) on container giving uneven on torque pressure
PERSISTING	High peel forces required for removal of ALKOflex™ induction liner from container rim	Induction energy to high Low on-torque levels insufficient conductive heat transfer away from sealing area Incorrect sized one-piece liner with excessive overhang of the container
PERSISTING	High closure removal torques from container for consumers	Removal tabs on one-piece liners are bonding the closure and container (tab stick) High on-torques prior to induction sealing
OCCASIONAL	ALKOseal™ Secondary re-seal wad pull out/pull up of liner	Lack of free rotation of the secondary re-seal liner due to oversized liner Incorrectly sized, poorly cut liners allowing liner rough edges to interfere in rotation Insufficient liner clearance due to closure design Incorrectly specified peel strength forces too high Off-centre wadding of liner into closure, not fully secured under the retention feature

Crab claw closure



Observations

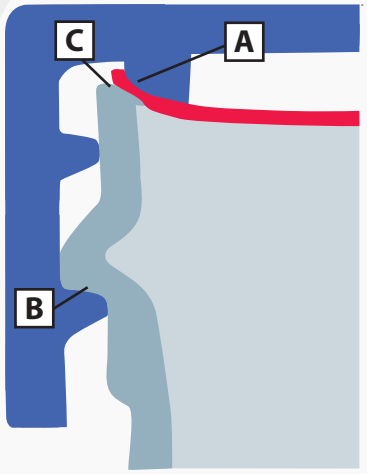
A Closure is not designed to have a retaining ring for the overhang of liner to fit between the crab claw and bottom of the thread

B Uneven and insufficient pressure on liner
Insufficient on-torque the pressure bead has not yet come in contact with the liner to ensure proper pressure

C Liner is being wedged between thread of closure and container
This may result in uneven contact of threads when low on-torque is applied
Higher on-torque would be beneficial

D Closure originally designed to not have a liner
Redesign closure to allow overhang of liner to fit into closure

Offset pressure bead



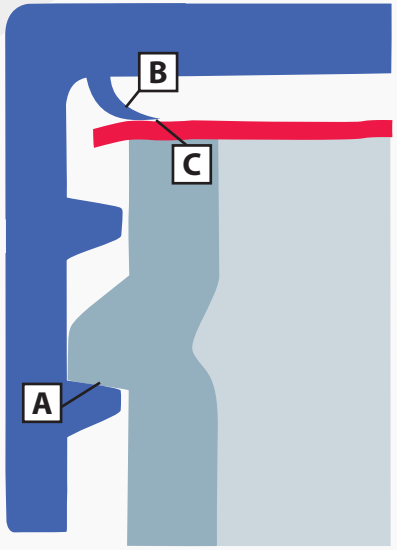
Observations

A Pressure bead of closure does not line up with land area of container
Closure was not designed to properly fit container

B Good thread contact

C Very narrow land area
Redesign closure to properly match and fit container

Crab claw closure



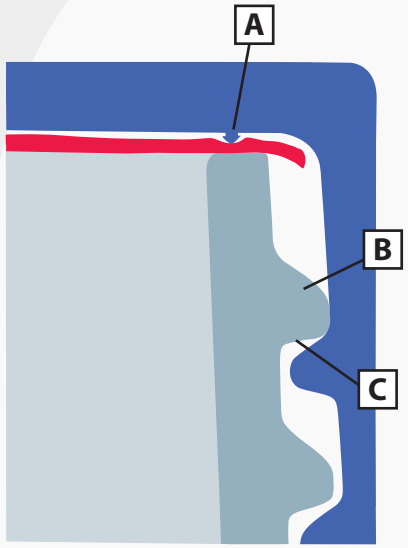
Observations

A Excellent thread engagement

B Closure designed with a 'crab claw'. If overheated (high power) on induction sealer, will cause the 'crab claw' to melt and put less pressure on land area thus creating a leaker
Design pressure bead to give a more uniform and consistent pressure when induction sealing

C 'Crab claw' does not sit centrally over the land area and seal will not be fully optimised when fully on-torqued
Move the crab claw to suit the land area of the container

Small pressure bead



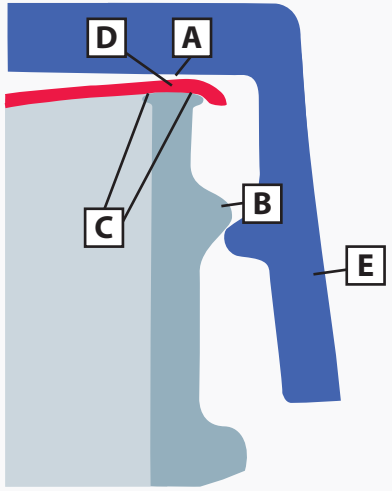
Observations

A Pressure bead is likely to melt during induction
Pressure bead is nicely centred on land area
Land area is large but is not optimised due to small pressure bead
Increase size of pressure bead

B Poor engagement of threads
Ensure thread design of both container and closure are compatible

C Thread design could encourage stripping and contribute to uneven pressure

Poor thread engagement



Observations

A Uneven pressure on land area

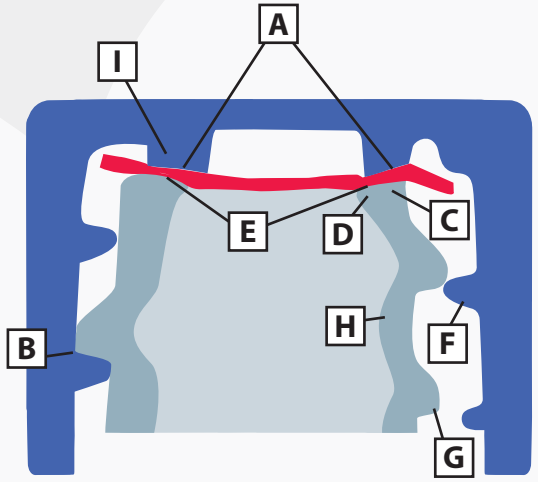
B Threads stripping
Ensure the shape and pitch of the threads are properly matched between the closure and the container

C Excessive melt down of land area

D Weak seal

E Side wall of closure distorted
Design closure to prevent distortion when properly torqued on by increasing wall thickness

Weak container neck profile



Observations

A Good pressure on liner from closure

B Good thread contact on left hand side of container

C Pressure bead is directly on land area on right hand side of container

D Melt down on land area

E Strong seal is not a leaker

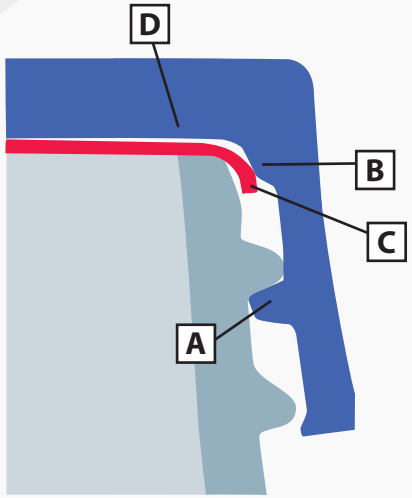
F Closure was not designed to properly fit container
Redesign closure for a tighter thread fit to ensure proper on-torque

G Threads will strip when closure is torqued on

H Side walls of container shown are not strong enough, therefore it will distort when closure is sealed with proper on-torque

I Pressure bead of closure does not line-up with land area of container
Redesign closure to position pressure beads central to neck land area

Insufficient room in closure for liner



Observations

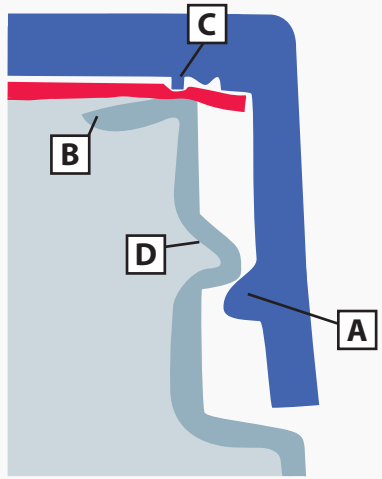
A Good thread engagement

B Thread start of the closure forces overhang of liner, down the side of the container

C Closure is not designed to accommodate a liner, thus causing the overhang
Redesign closure to allow overhang of liner to smaller or fit into cavity

D Will have uneven pressure on liner due to distortion of closure when very high on-torques are applied

Distorted land area of container



Observations

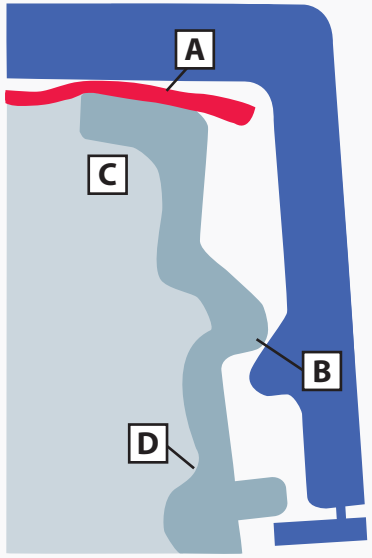
A Side walls of closure being forced away from container walls as container and closure threads are incompatible
Design threads of closure to be compatible with threads of container

B Sealing land area is distorted, leaving very little area for liner to seal
Ensure container land area is flat

C Pressure ring of closure is only coming in contact with the extreme edge of land area
Design closure to have larger pressure rings in contact with land area

D Container neck area is weak
Strengthen neck finish and ensure side wall of closure is strong enough that it will not distort when on-torqued

Uneven pressure on land area of container



Observations

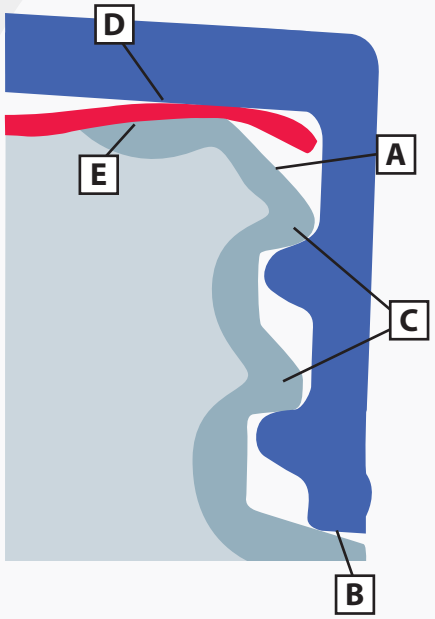
A Uneven pressure on land area

B Threads stripping
Ensure the shape and pitch of the threads are properly matched between the closure and the container

C Land area is at an angle

D Side wall of container weak at base of neck

Excessive high on-torques



Observations

A The neck of the container is being distorted due to high on-torques
Strengthen neck finish of the containers

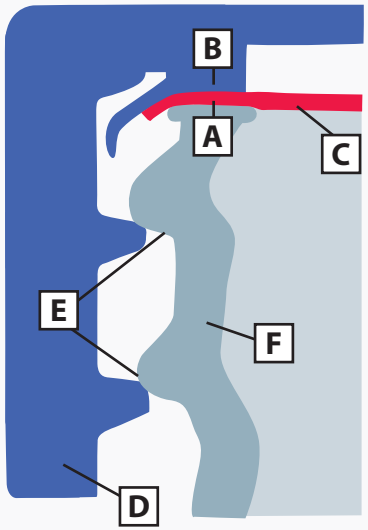
B Bottom of closure touches shoulder of container
Shorten the "H" dimension of the container to allow the closure to tighten properly and without bottoming out

C Good thread engagement between closure and container

D Uneven pressure on land area

E Land area not flat, possibly due to neck finish distorting or too much on-torque

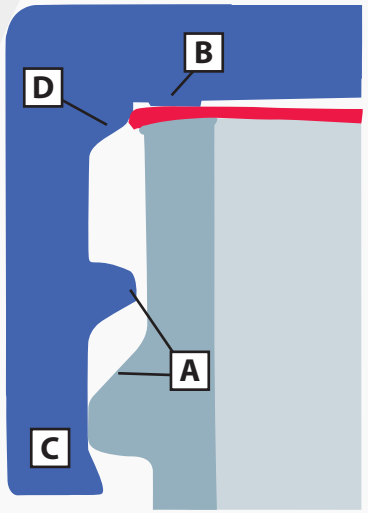
Closure / container thread engagement not compatible



Observations

- **A** Pressure bead is directly on land area, creating good melt down
- **B** Good pressure on liner from closure
- **C** Strong seal would not be a leaker
- **D** Closure is larger than container
  A redesigned closure will provide consistent result
- **E** Threads will strip when closure is torqued on
- **F** Side walls of container distorted when closure is sealed with proper on-torque

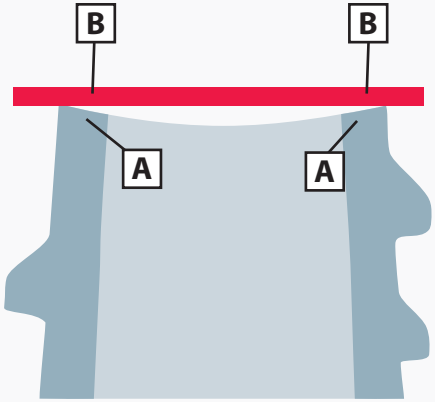
Poor thread engagement



Observations

- **A** Closure threads do not match containers' thread, leading to insufficient thread engagement
  Design a closure thread to match container threads
- **B** Uneven pressure on liner
- **C** Cannot achieve proper on-torque
- **D** No Cavity for overhang of liner
  Design a closure with cavity or retaining ring for the overhang of liner to fit under

Container land area not flat



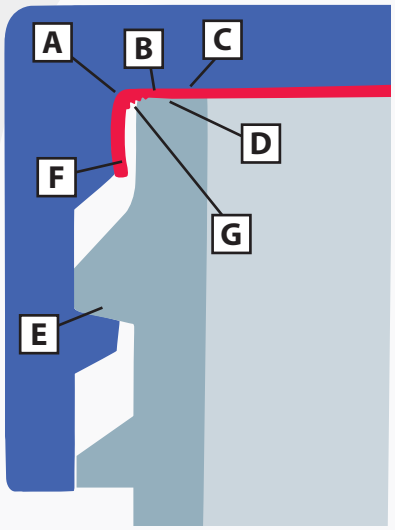
Observations

A Uneven land area
Land area has saddle which creates high and low spots
Possible uneven wear in container moulds
Incorrect spin trimming of neck
Overheating during induction process
Excessive meltdown of land area

Ensure land area is flat by trimming or grinding
Refurbish container moulds

B Uneven pressure on liner

Oversized liner



Observations

A Closure was not designed for oversized liner, with no cavity in closure for liner
Redesign closure for proper retention of liner

B Strong seal

C Good pressure from closure

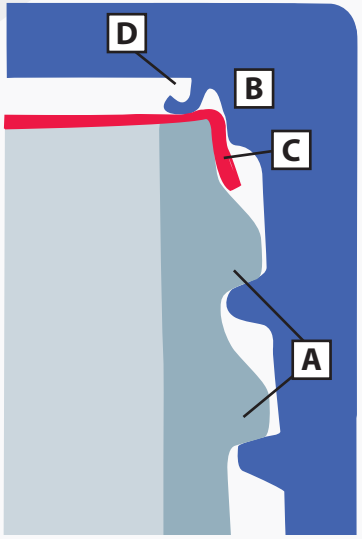
D Wide land area

E Good thread contact

F Overhang of liner is restricted

G Wrinkles on land area can cause leakers

Weak pressure bead



Observations

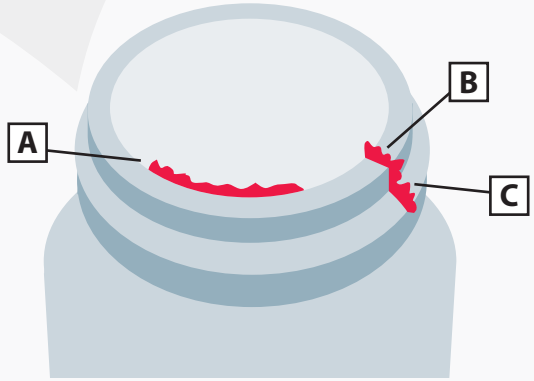
A Good thread engagement between closure and container
Redesign closure to allow overhang of liner

B Closure not designed to have a cavity or retaining ring for the overhang of liner to fit under

C Overhang of liner gets wedged between threads of closure and container
This will result in uneven pressure on the liner, especially when low on-torques are applied

D Pressure bead is distorted, because of too high on-torque. This will create uneven pressure on liner and cause possible leakers
Check induction sealer to be sure that it's not overheating the liner and distorting or melting the pressure ring
Check to see if closures are receiving proper on-torque

Excessive flashing



Observations

A Poor finish of land area, will impact the sealing process
Ensure land area is flat by trimming or grinding

B Untrimmed flashing/parting line, will affect on-torque
Refurbish moulds

C Untrimmed flashing, cause uneven thread pressure
Clean and check moulds for excessive material build-up

Enercon Industries

Over the past 40 years, Enercon has been installing induction sealers into both large and small production facilities on every continent.

From high speed, inline cap sealers to manual handheld units, Enercon offers a fully comprehensive and diverse range of induction sealing technology for today's expanding market.

Enercon's Super Seal™ range of cap sealers are designed to give customers innovative technology at the lowest possible cost of ownership, delivered through high levels of reliability, minimal maintenance costs and reduced overheads.

Global service and support

Although Enercon induction cap sealing machines are robust and require minimal servicing, Enercon has a global service and support team available 365 days a year. Enercon's network of international representatives ensure customers can access local help – wherever they are in the world.

Enercon's range of Induction Sealers:

Enercon has a sealer to suit every production environment - from low volume through to the world's fastest production lines.

Enercon machines can seal caps from 15mm to 150mm in diameter, including unusual shapes and sizes.

All sealers are compact and air-cooled, and meet UK and European regulations. They deliver hygienic, repeatable, and reliable sealing to help protect your product and brand.

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Super Seal™ Max

The most powerful cap sealer ever made

Runs at line speeds up to 100 metres per minute

Super Seal™ Touch

A powerful, compact single coil machine

Runs at line speeds up to 40 metres per minute

Super Seal™ Range

The world's best-selling induction range

Runs at line speeds up to 30 metres per minute

Super Seal™ Junior

The portable induction sealer

Ideal for low product volumes, start-ups, product validation and laboratory environments

Induction Sealing Coils:

A key component of your induction sealer is your choice of coil, or sealing head, as it is also known.

Enercon offers the largest range of sealing coils to suit a wide range of applications. All of Enercon's coils are interchangeable, meaning you can seal different products on a single production line.

Enercon's experts will work with you to ensure you have the correct coil for your container and cap to allow maximum productivity with the lowest energy consumption.

me.ro S.p.A.
Cap Sealing System
made in ITALY

Reliability, Hi-Tech and know how developed in over fifty years of experience. Here it is the new Digital electronic generators for cap sealing system.

The induction sealing technology is a sector in full expansion where ME.RO has emerged as a leading company. In a growing market where the producers are concerned to protect their products from illicit opening guaranteeing the consumer of the product integrity, ME.RO have succeeded in giving a practical and efficient answer to their requirements, to all sectors in the industry of packaging: food, beverage, pharmaceutical, chemical, cosmetic, agrochemical and petrol.

Their portfolio is made of several different models, from a manual hand held sealer to in line high performing sealers.

The inline models can be air cooled (majority of our applications) or water cooled for very fast lines. In this particular field ME.RO has been able to provide induction sealers with very high productivity (up to 40-50.000 bottles/h).

Since the beginning we have followed this difficult market with a great attention, and the result is that we can easily say nowadays that the majority of these big beverage producers are using our induction cap sealers

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PILLAR Technologies

An ITW Company

Pillar Technologies prides itself on the production and development of state-of-the-art induction sealers. In 1973, Pillar launched the first solid-state induction cap sealer and have since made critical and nuanced tweaks to their induction sealing machines as technology progressed. With customers seeking versatility and portability, Pillar has recently introduced advanced induction sealers with hand-held and energy efficient capabilities

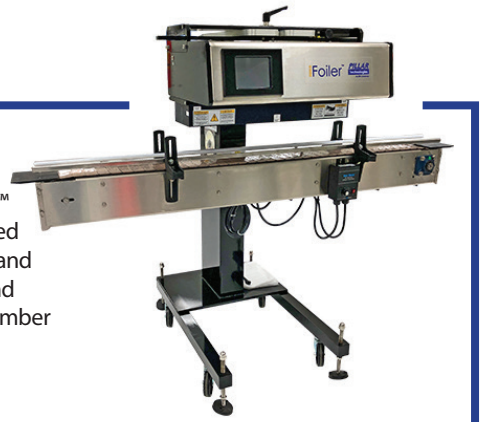
Pillar delivers customers quality induction sealers for a variety of applications including automotive; health and beauty; pharmaceuticals and nutraceuticals; and many other cap sealing needs.

Pillar Technology has delivered innovation after innovation in the induction sealing industry. Pillar's induction sealing machines deliver high-end, consistent bottle sealing.

Check out what makes the Pillar Technologies difference and contact the Pillar team to learn more about our induction sealers.

iFoiler™ Induction Sealer

Introduced in 2019, the Pillar iFoiler™ Induction Sealer provides unmatched cap sealing efficiency, a responsive and functional touchscreen interface, and microprocessor capabilities to remember functions for specific cap sealing applications.



Cadet Portable Induction Sealer

Pillar's iFoiler™ Cadet is a portable handheld sealer and the first portable induction sealer of its kind. Despite its portability, the iFoiler™ Cadet delivers the same strong and efficient seals common to all Pillar products.

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Hartland, WI 53029-0110

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Email: capsealers@pillartech.com

relco

Induction Sealing Technology

Sealing, made better.

Since 1985, Relco has been at the forefront of Induction sealing. Our technology allows for a huge leap forward in control, consistency, quality, efficiency and sustainability which is unmatched in the industry.

'Relco reliability is **second to none**'.

Jesse Lehga, VP

DRW Diagnostics for the Real World

'...their induction sealing head technology has been **world class**'.

Sam Alarcon, VP

JEWETT

From the first concept to deployment, we're there **every step of the project**.

Unique ideas bought to life.

Whether you require Punch & Seal, Pick & Place, Screw Cap or Capless sealing, we offer both bespoke and off-the-shelf equipment.

From blue to green.

We are always working to reduce equipment energy consumption and cutting down on material wastage in the sealing process.

Global reach

Thousands of miles doesn't stop us from offering excellent support for our equipment. That's why we have repeat customers in the USA, China and Brazil.

No job too big or too small.

At Relco, we work with customers sealing 160 units per minute, as well as those only sealing 160 units per day.

Trusted by the best.

We have experience working with **over a thousand** companies in industries including **Life Sciences, Food & Drink, and Consumer Goods**.

Consistently perfect.

Get in touch now and talk to us about your ideas.

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Sigma CapSeal

Induction Cap Sealing Solutions

48 YEARS
EXPERIENCE IN CAP & CLOSURE AUTOMATION

Sigma CapSeal, a part of Electronic Devices, is into the manufacturing of induction heating and high-frequency dielectric equipment. Being in the business for around five decades, we offer world-class solutions to leading packaging manufacturing businesses worldwide.

Our solutions comply with the regulations of regions like USA, South Africa, Middle East and UK, and find a place in the manufacturing environments of more than 80 countries. We have quality induction sealing solutions that are ideal for industries like healthcare, dairy, FMCG, special chemicals, personal care, confectionery, and more.

Our customized solutions meet the precise production standards for every business. We have solutions best suited for small and big packaging manufacturing businesses of all kinds.

80+ Exports over 80+Countries

30K Satisfied Customers

Global Service & Support

Sigma CapSeal has always been trusted by the best names in the industry. We have through after-sales support and service in over 80+ countries where we operate. Our dedicated team of support staff ensures there are no hiccups during the implementation of machinery in an industrial environment. Our 24x7x365 support also gives our clients assurance of getting assistance whenever they require it.

Customized manufacturing solutions

We believe in precisely meeting the manufacturing demands of any business. There is no one-size-fits-all approach, which helps us create custom solutions for better business results. It is our endeavour to ensure our customers get the best value for their money every time. All our induction sealing solutions come with a CE marking.

Scalable induction sealing solutions

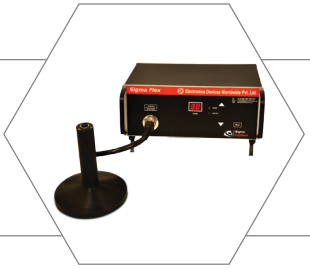
Sigma CapSeal has a dedicated team of expert engineers who deliver cutting-edge and cost-effective solutions. Manufacturing businesses around the world trust our expertise and diverse experience for all their needs. Our dedicated support system ensures there are no hiccups during packaging operations. Our induction sealing machines can seal caps from 15mm to 150mm diameter.

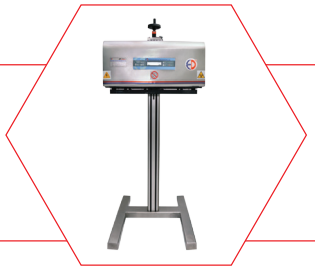
ADVANTAGES

KNOWLEDGE	PERFORMANCE	DEPENDABILITY	RELIABILITY
Years of experience enables us to provide correct advice.	Wide range of container mouth size can be sealed in a single machine, Machine suitable for very high speed lines.	Rugged & reliable equipment & excellent after sales service.	Facilities always available for conducting trials & evaluation of seals,caps & containers.

Sigma Flex

It is a manual induction cap sealing machine ideal for use in laboratories or for batch production. The compact design of the machine allows you to operate it even from a table top.



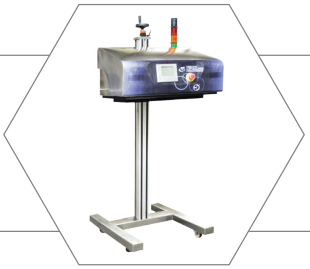


Sigma I Neo

This inline induction cap sealing machine offers sealing speeds of up to 32 feet/min. It is reliable, sturdy, and offers increased mobility through built-in casters.

Sigma III Touch

It is the first touchscreen induction cap sealing machine and ideal for high-speed operations. The compact air-cool structure ensures hassle-free operations even at pace.



Sigma Jet CFR 21

This inline induction cap sealing machine is USFDA CFR Title 21 compliant. The standard and tunnel sealing heads allow for sealing of almost every possible closure design.

Electronics Devices
WorldwidePvt.Ltd.
Making things happen

Write email to us...

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MAKING THINGS HAPPEN

Meyer Seals® Technical Guide to Induction Sealing

Author Andrew McLean

Version 1.1 / 2022

FRONT COVER PICTURE
Peter Rothweiler BSc. Eng., Managing Director,
joined Meyer Seals in 1995. Initially responsible for sales outside German borders, Peter took over overall responsibility for all sales activities in 1998. Since 2003, Peter has been responsible for the areas of Technology, Sales and R&D, as Managing Director.

ABOUT THE AUTHOR
Andrew McLean FCIM,
has been actively involved in the global liner industry since 1996, covering various senior executive Management roles; Technical, R&D, Commercial Sales and Marketing.

Meyer Seals ® Global Locations

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Ubon Ratchathani, Thailand

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