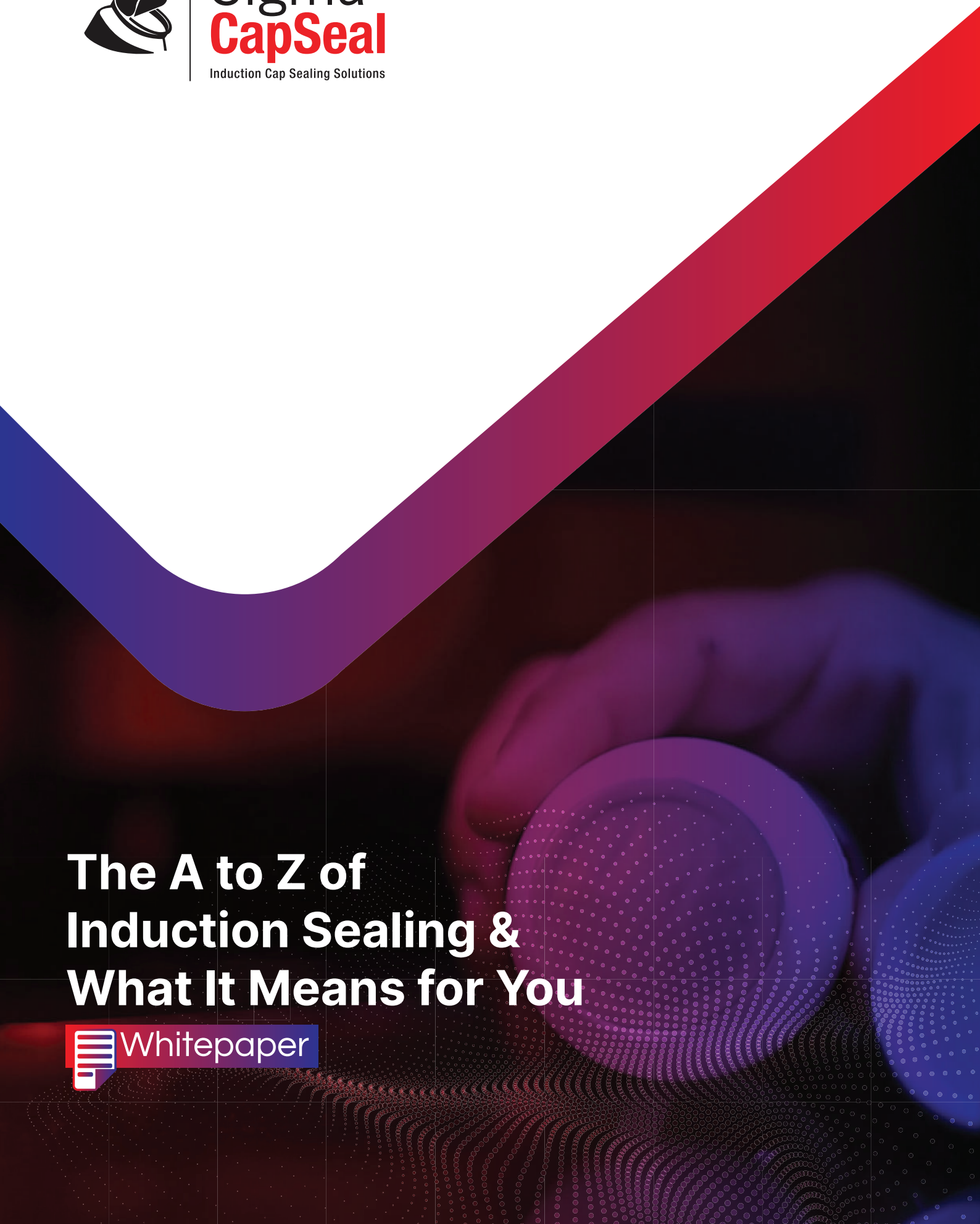
Sigma CapSeal

Induction Cap Sealing Solutions



The A to Z of Induction Sealing & What It Means for You

Whitepaper

CONTENT

"If you have a bottle, No matter what shape and size
We will seal it for you"

EXECUTIVE SUMMARY

Product sealing is one of the crucial aspects of your packaging manufacturing business. It can affect everything from packaging quality, output speed, design, brand image to the success of your business. The business outcomes of sealing technology also depend upon factors like packaging, environment, material, and production parameters. In many ways, the importance of the sealing process remains underestimated in production.

The sealing technology, however, assumes a lot of importance for manufacturers. It can make or break the production process. Adopting the appropriate sealing methodology allows you to ensure that the product is safe for consumption and meets quality standards. The product presentation will also remain top-notch and help in improving the brand visibility.

In case of inadequate sealing, there can be several issues. A poor-quality product can lead to a dent in brand image and affect the finances due to no sales. Operationally, uneven sealing can affect the speed and efficiency of the production process. It is thus vital to bring efficiency and quality into the production process.

One of the best ways to do that is through an induction sealer. The induction sealing process has several advantages for any packaging manufacturing business. This whitepaper explores everything about induction sealing and how you can leverage it for the success of your business.

How does the induction sealing process work?

Induction cap sealing is a tamper-evident technology in the packaging manufacturing segment. The process helps overcome limitations related to sealing rigid containers.

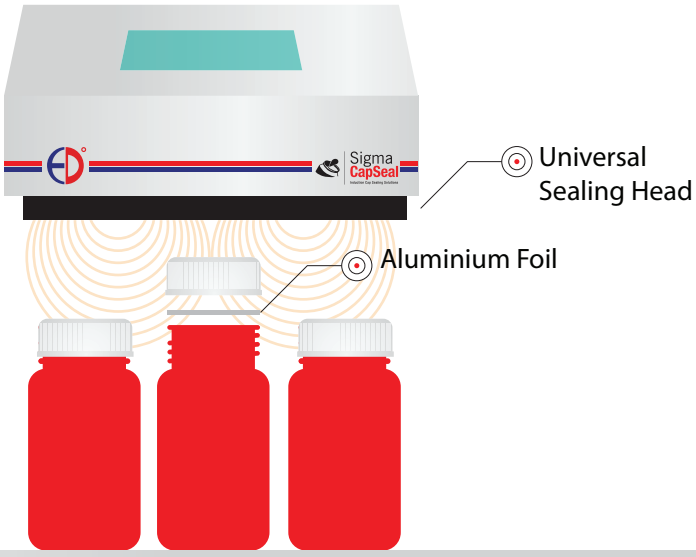
Induction sealing involves the use of a multi-layer laminated liner in the cap of the container. After placing the cap, the aluminum foil of the liner gets heated through electromagnetic induction. It creates a heat seal material layer that bonds perfectly with the container's rim.

Induction sealing helps achieve a hermetic seal that is tamper-evident, leak-proof, and robust. An appropriately engineered seal will also be easy to open by the consumer. The laminated liner ensures control over sealing and leads to a safe bond that protects product spillage. It is thus essential to choose the appropriate liner material to ensure the safety and usability of the product. The material also needs to fit the rigors of the sealing process.

Induction liners have a secure laminate structure where each layer has a critical role in terms of product usability and sealing performance. Liners include heat seal layers that match the container material and an aluminum foil layer. It generates heat due to electromagnetic induction. Liners usually come in one or two-piece designs.

Products that do not require resealing are ideal for one-piece sealers. The two-piece sealers are handy for products that need resealing. They come with a backing board structure that aids resealing after the original seal gets removed. A wax coating bonds the two-piece liners before usage. The wax gets dispersed when the liner gets heated.

When we talk of pharmaceutical applications, the printing on the upper layers helps identify the attempts of product tampering. There are also several other technologies through which it is possible to establish tamper-evidence protection. Some of them include holographic films, etched foils, and color-changing inks.



Why businesses use induction sealing?

Prevents product Leakage

Sealed products remain safe from any leakage and spillage. The induction sealing technology ensures products remain airtight and free from intrusion. Whether it is the storage or transportation stage, the product will not leak. So, when it reaches the hands of the consumer, it will be in a consumable condition. Most leading retailing and shipping companies today use induction sealing to ensure quality packaging.

Improves product Shelf-life

Induction sealing gives hermetic seals that lock the product and prevent any moisture or oxygen from seeping inside. It helps in maintaining product quality and extending its durability. The product will last up to its expiry date if it remains untouched.

Increases Productivity

As compared to other sealing methods, induction sealing is beneficial productivity-wise. This equipment can work at high speeds and eliminate the touching of containers. You can also power on the machine and start the sealing process instantly.

When we talk of conduction sealing, there are long waiting periods because of warming up and cooling down stages. It is also essential to maintain an apt sealing temperature. In the induction sealing process, only the foil liner gets heated.

Induction sealers are not bulky, and you can move them from one production line to another. You can place them at the existing conveyor. There is no wastage of time, and you can continue with the production process without any interruptions. Induction sealers with the universal sealing head also speed up the production process.

Promotes Eco - Friendliness

The Conduction sealing method consumes a lot of energy. On the other hand, induction sealing requires less power. It is thus a beneficial option in terms of energy consumption. It also requires less plastic in closures, and the need for foil thickness is minimum. You can have a preferred strength of foil for easy peeling and complete protection.

Maintains Product Quality

An induction sealed product offers tamper-evidence protection. Nobody can access the product without breaking the foil near the container head. Consumers also remain satisfied with the product quality when they see intact foils. The product remains fit for consumption without any second thought.

Leads to Cost Reduction

There are several ways through which a packaging manufacturing business can save costs. Induction sealing machines are energy-economical even at higher production output rates. If there is faulty packaging, the equipment rejects the product. It doesn't leave the factory then.

These machines also do not require much maintenance. It also means that there will be hardly any downtime. With full-speed production, you can experience better productivity and improved business results.

Avoids Maintenance

The latest and innovative induction sealers hardly require any maintenance to function effectively. There is no contact between containers and the sealer during the sealing process. So, there is no need for any frequent cleaning or maintenance of the equipment.

How induction sealing ensures tamper-evident product packaging?

Packaging manufacturing businesses need to offer reliable sealing to satisfy customer needs and meet regulatory norms. It also needs to be tamper-evident and remain easily accessible to the consumer. An induction sealing machine can help achieve these objectives when operated properly. Packaging for over-the-counter products especially assumes a lot more importance.

It might often put businesses in a situation of conflict. Regulatory agencies would want packaging that is secure and robust. The product integrity must remain maintained at all costs. Additionally, any sign of tampering should also be visible. However, when it comes to consumers, they would want that the packaging is easy to open and does not require much effort.

FDA authorities emphasize product packaging in light of some shocking incidents of the past. There have been incidences of people dying in the US in 1983 due to contamination of analgesic capsules with cyanide. Regulatory agencies thus require an indication of packaging integrity with apt labeling to give consumers a cue about product usability.

These agencies also require manufacturers to have distinctive patterns or logos to help consumers identify if the product got tampered with in any way. Learning from the actions of the FDA, other regulatory agencies worldwide have put in place the best practices for packaging. Tamper-evident packaging also helps in preventing counterfeiting of any form in the supply chain.

As a packaging manufacturing business owner, you have several options of including tamper-evident features in your products. You can use breakable caps, shrink wrap films, wrappers, bands, and much more. While it will further secure the products, there might be a slight difficulty for consumers to access the product quickly.

If there are seals and breakable closures, it might require some physical strength to access the products. People with mobility issues and some consumers with low physical abilities might face difficulties.

How do induction sealer ensure effective sealing?

There are several factors involved in getting a perfect seal. The filling plants should ensure that the seal has the correct pressure. There should also be an optimum level of heat with enough time son the filling line. It will ensure that a secure bond forms between container and seal. When there is enough pressure, the liner will give even sealing throughout the container's head. To get the appropriate pressure, you need to consider the closure and container's thread design, and the equipment's torque settings.

It is essential to match the design of the threads and neck of the container with the closure. It will ensure an even pressure that will prevent weighing down of closure on container's closure. If the liner has uneven pressure, it can be because of defects in the container's land area. You should keep an eye on the torque heads to make sure the closure has appropriate on-torque.

Closures can have over-torque that could strip the threads and cause uneven pressure. They should also have a rigid structure so that their shape does not get distorted when torqued. It is essential to have suitable thread engagement to get uniform pressure in the closure and container combination. The heat applied to the liner should match the properties of the induction element and line speed.

There should be enough dwell time for heating the coil to an appropriate temperature. It will lead to the melting of the sealing surface and bonding with the container's land area. When the initial heating happens, the liner's temperature can touch more than 200 degrees. However, when the liner starts to cool and reaches 130 degrees, it begins bonding with the land area.

An appropriate heating level, dwell time, and cooling time for induction sealing depends on the container's content. Containers absorb the liner's heat and function as a heat sink. In case there is uneven pressure, the land area will likely experience poor sealing. Uneven handling of the liner around the container's circumference can also lead to overheating. It can cause an excessive meltdown, leading to further uneven pressure.

When the tabs or liner overhang and are at the downside of the container, there can be issues. The induction field will react differently to the foil in a vertical position passing through the induction head. The folded tabs lead to a deflection of the induction field and less heating in the liner.

It is thus crucial to identify the apt operating conditions for reliable and tamper-evident sealing. Some components include liner design, container, line speed, product, and induction settings. Once you identify the best settings, you can experience fast and reliable sealing.

Steps to achieve desired seal with induction sealers

Products with reliable sealing arouse customer confidence concerning the product quality. You would already know that poor sealing of products will make customers doubt your product's quality and give a negative impression about your brand. There will be other disadvantages like damages during transport and spillage.

When you are aware of the different aspects of induction sealing, you can get desired seals. It is not difficult as you only need to match the **liner, sealer, and cap**. You can also define testing methods to identify reliable sealing. Here are some things to consider when desiring the perfect seal for your products

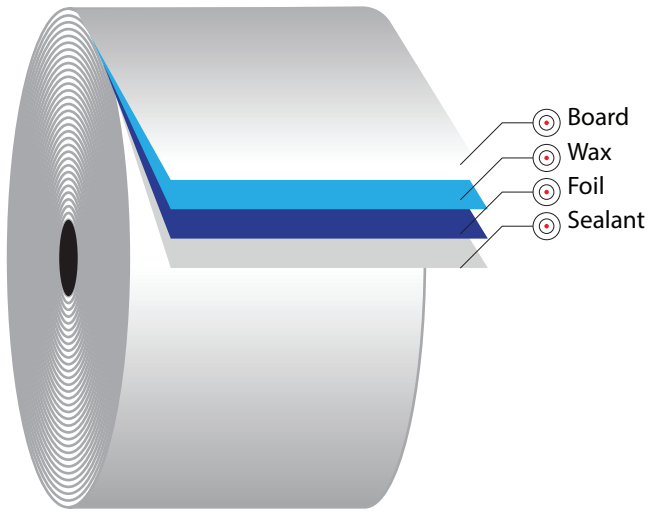
1. Material Matching

It doesn't matter what the material of closure is. You can have closures made from PET, glass, PLA, Barex, or metal. Achieving a perfect seal is still possible with any of these closure materials. Depending on the product packaged, you can choose the apt induction seal.

If your products have acids, chemicals, solvents, alcohol, or other volatile ingredients, you may need a protective layer. You can put it in between the foil and the heat seal film to avoid corrosion. Single-piece liners come with a foam or paper layer. The material seals the container lip without leaving any scope for resealing. Products in the F&B industry typically use this arrangement.

In the case of two-piece liners, there is a wax bonded material. It comes with a backing that is a board, foam, or pulp. It remains bonded to the seal structure with a wax bond. The wax gets heated, melted, and absorbed during the induction process. In the case of volatile products, a barrier layer is beneficial between the foil and heat seal layer.

You can also use a two-piece reseal that gives a high-barrier retain liner along with induction foil. A polyester film on the backing enables improved oxygen permeation and moisture vapor transmission post the removal of foil seal.



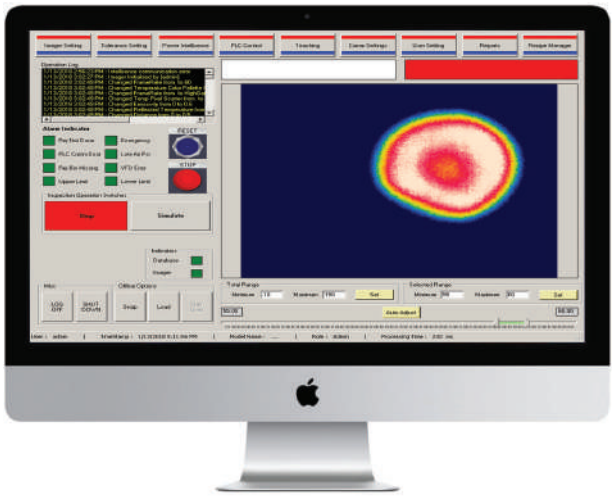
2. Induction Sealer

Selecting the apt induction sealer requires consideration of several variables. To begin with, you need to keep in mind the foil diameter. A smaller diameter will require less energy to seal. Depending upon the thickness of a foil, it can take more or less time to heat. So, understanding the foil type of application is critical.

You also need to be aware of the line speed in feet-per-minute. If containers move fast, they will not remain under the sealer for long. You will need a sealer with a higher power. The next consideration is the spacing between containers and cap or bottle geometries, which will ensure an optimal sealing process.

You can seal most bottles and caps with a flat sealing head. But containers with sports caps come with a big gap between the container and the induction liner. It requires a different sealing head. You will also have to determine the application range. Based on the closures or containers, you will need to have an appropriate system.

Once you have all information in place, you need to have an optimal sealing head and power supply. Tunnel coils are ideal for closures with smaller diameters. In the case of sports caps, deep tunnel coils are effective. Meanwhile, a flat coil is best suited for closures over 53 mm in diameter. However, a universal sealing head is the best option for application with a variety of closure sizes.



3. Operating Window

Once you finalize the induction sealing equipment, caps, and liners, you will have to choose an operating window. It will help you get an optimal sealing range. You can get this by checking the records of sealing ranges with no, partial, good, and overheated seals. It is a critical step as you will get the baseline information for each application.

When you start, make sure the alignment and orientation of the sealing head are appropriate. There should be a consistent air gap between the closure and the sealing head. The path of containers should also be at the center of the sealing head or under a pivoted sealing head.

The conveyor speed should have a fixed value for optimal results. You will also have to ensure the compatibility of containers and closures. Check if there are any defects in the caps. Having a consistent closure application torque is also essential as 80% of sealing issues are due to this.

You can have a minimum set point and start the process. Keep the output percentage at a bare minimum with other variables fixed. You can then place a single container and check for the sealing level of the container. If there was no seal, you can increase the output level by five percent till you get a partial seal. You can then increment the output by one or two percent till you get a complete seal.

To have the maximum set point, you can increase the output level by five percent till there are signs of overheating. You can then decrease the output level by one or two percent till the overheating gets eliminated. It will help you determine the maximum set point of the operating window. When you record the data, the output percentage of the best seal will be within the minimum and maximum output set points.

4. Determining a good seal

You can assess seal quality even though there are no fixed industry standards for induction seal integrity. There are several methods like vision systems, wet or dry vacuum testing, shaking, squeezing, or applying mechanical pressure. Another way you can check seal integrity is to see whether there is discoloration or wrinkling of the liner, darkening from overheating, or adhesion around the circumference.

FAQ

1. What should be the material of the containers?

You can induction seal both plastic and glass containers with a diameter of up to 140 mm. Irrespective of the shape of containers, sealing them is possible.

2. What products can I induction seal?

You can seal food items, water, or any products in solid, liquid, or powdered form. It is also possible to seal automotive oil, chilled products, or dried products like herbs.

3. What foil liners are required for induction sealing?

You have several foil options, right from basic aluminium discs to advanced vented foils. To meet the appropriate sealing requirements, your cap supplier can also help you select the relevant foil.

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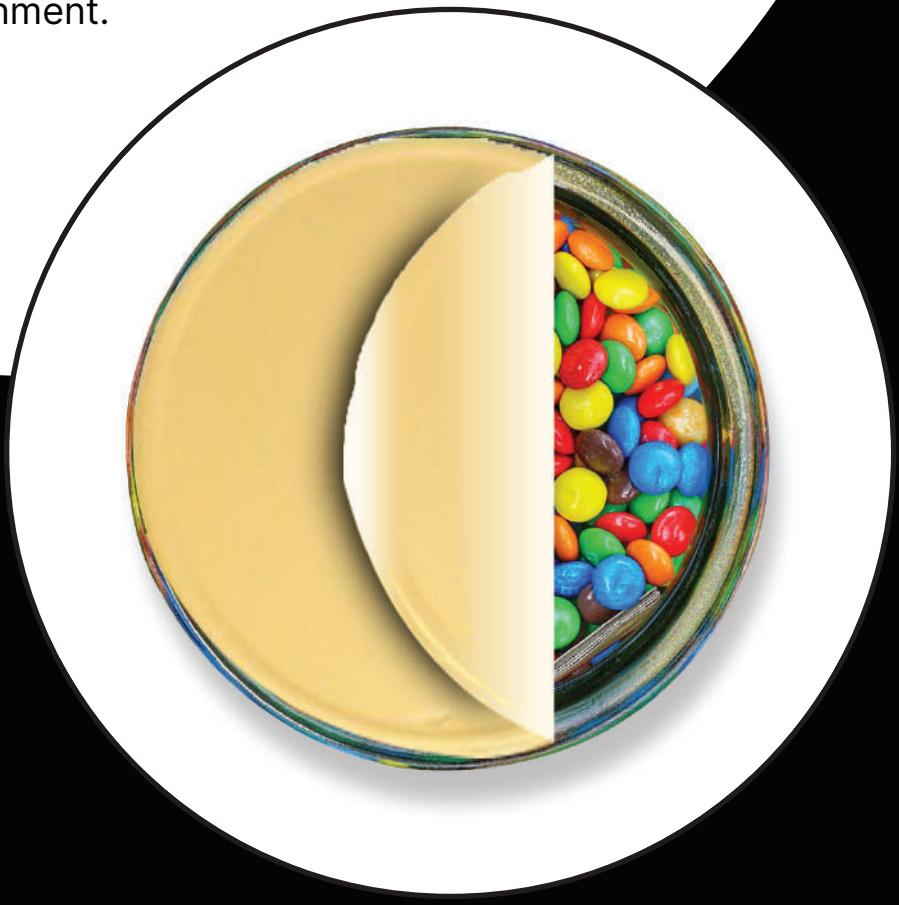
Induction Cap Sealing Solutions

Sigma CapSeal is an industry-leading packaging manufacturing solutions provider. We have been in the business for close to five decades, offering a range of induction sealing and caps and closure machines. Business giants from more than 80 countries trust us to deliver quality induction sealing solutions.

Products sealed from our machines remain free from tamper-evidence, counterfeiting, leakage, and spillage. Our support team remains committed to delivering excellent support to ensure smooth implementation and working of machines in your production environment.



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