Achieve a Perfect Seal
5 Secrets to Induction Cap Sealing Success
Today’s Presenters

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Overview

Induction Seal Function
Matching your Materials: Product/Liner/Cap
Cap Concerns
  Torque, Geometry, Depth of foil
Induction Sealing Principles PHT
How to set-up an operating window
Test methods for identifying a good seal
Troubleshooting Tips from the Pros
Questions/Answers
5 Secrets to Achieving a Perfect Seal

- Optimize Materials & Equipment
- Heat
- Pressure
- Time
- Operating window
- TORQUE!
- Document Results
Induction Seal’s Functionality
Leak Prevention
Tamper Evidence | Consumer Confidence
Preserve Freshness
Removal Characteristics

**Peelable - Clean Peel**
The entire liner peels away cleanly, leaving the container opening clean and clear of residue.

**Peelable - Tamper Indicating**
The liner peels away but leaves a residue on the container opening, showing visual evidence of entry.

**True Weld – Pierceable (Easy Entry)**
Seal can be easily punctured, torn, or broken with one's finger to open and leaves visible evidence of entry.

**True Weld - Puncture Resistant**
The foil must be cut to gain entry, usually with the help of an implement.
Container - Liner Compatibility

Polyethylene (PE)
Polypropylene (PP)
Polyester (PET)
Polyvinyl Chloride (PVC)
Polystyrene (PS)
Glass
Filling Method / Product Treatment

- Cold Fill
- Hot Fill
- Flood Fill
- Retort
# Product Consideration

<table>
<thead>
<tr>
<th>Food</th>
<th>Personal Care</th>
<th>Liquid</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beverage</td>
<td>Dry</td>
<td>High Acid</td>
</tr>
<tr>
<td>Pharmaceutical</td>
<td>Viscous</td>
<td>Aggressive Ingredient</td>
</tr>
<tr>
<td>Chemical</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Aggressive Contents
*(Barrier Layer)*

- Closure
- Backing Foil
- **Barrier**
- Heat Seal
- Container

### Inert Contents

- Closure
- Backing Foil
- Heat Seal
- Container
Types of Induction Seals | One Piece

One Piece Foil Seal

- Backing
- Foil
- PET Barrier
- Heat Seal

Reseal not critical/cap reseal adequate
Food & beverage applications
Wide-mouth & dispensing closures

One Piece Induction (Foil Required)

Induction heat to soften the heat seal surface
Adhered to container
T.E. capable
Barrier properties - foil
Types of Induction Seals | One Piece

One Piece Backings
(closure contact surface)

Materials
- Board
- Foam
  - Laminated (0.0055” - 0.0105”)
  - Extruded (0.015” - 0.040”)

Strength for Liner Retention in Closure
Even Pressure Upon Sealing
Types of Induction Seals | Two Piece

**Two Piece Foil Seal**
- Backing
- Temporary Bond
- Foil
- PET Barrier
- Heat Seal

**Two Piece Induction**
(Foil Required)
- Induction heat to soften the heat seal surface
- Primary hermetic seal & optional secondary seal (2-piece)
- Adhered to container
- T.E. capable
- Barrier properties – foil

**Temporary Bond:**
- Wax Bond - softens during induction and absorbs into pulp
- Polymer Bond - weak bond separates at initial closure removal

Reseal critical/unlined cap reseal poor
Barrier (ie - Pharmaceutical & Nutraceutical)
Reseal (ie - AgChem & Automotive Fluids)
Types of Induction Seals | Two Piece

Two Piece Backings (reseal liner)

Materials
- Pulp
  - 0.020” - 0.035”
- Foam
  - Extruded
  - 0.015” - 0.040”
- Wax or Polymer Bonded – Temporary
  - Real Seal Liner Barrier (E, LE)

Insulate Closure from Heat
Strength for Liner Retention in Closure
Even Pressure Upon Sealing
Optional Facing: PET (printing)

FoilSeal™ - 2 Piece
Types of Induction Seals | Tabbed Versions

Tabbed Versions

One Piece
Lift ‘n’ Peel™

PET
PET Tab
Foam
Foil
Heat Seal

Two Piece
Top Tab™

Backing
Wax Bond

PET
PET Tab
Foam
Foil
Heat Seal

½ Moon Shaped Tabs

Easier to Grip
Youth/Advanced Age
Dexterity
Sight Impaired
No Contact with Seal/Product Surface
Matching the Induction Sealer to the Application
Matching Equipment

Cap Size
Foil Size
Depth of Foil

Line Speed
( BPM, FPM, MPM)
Cap/Bottle Geometry
Foil Type

Application Range
- Hot Fill
- Cold Fill
- Room Temperature
Cap Styles

Continuous Thread
Child Resistant
Dispensing
Cap Styles

Big Cap - Small Foil

Depth of Foil

Torque

Achieve a Perfect Seal
Sealer Options
Sealing Head Options

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Achieve a Perfect Seal
Pressure, Heat And Time
Pressure, Heat and Time

Cap Application Torque
Pressure, **Heat** and Time

Electromagnetic field reacts with foil to generate heat
Pressure, Heat and **Time**

**Conveyor Speed**
Pressure, Heat and Time

The Relationship is not linear
Establishing Your Cap Sealing Operating Window
Induction Seal Characteristics

- No Seal
- Partial Seal
- Good Seal
- Overheated Seal

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Achieve a Perfect Seal
Operating Window Best Practices

1. System Set up
2. Determine Minimum Sealing Power
3. Determine Maximum Sealing Power
4. Choose & Record Production Set Point

[Diagram showing the operating window with sections for No Seal, Marginal, Good Seal, and Over Heated]
Set up

Controlled and centered bottle path
Set Air gap –must be parallel to conveyor
Determine your minimum set-point

- **Good Seal**
- **Partial Seal**
- **No Seal**

**POWER INCREASE**

1ST TEST

TARGET

**POWER** 40%
Determine your maximum set-point

POWER INCREASE/DECREASE

1ST TEST

Overheated Seal

TARGET

Good Seal

TARGET

Partial Seal

POWER 58%

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Determine your production set-point

- No Seal: 58%
- Good Seal: 65%
- Over Heated: 65%

Achieve a Perfect Seal
Record Settings

Product
Cap Size
Conveyor speed
Power Level

Enercon Automated Induction Sealer Set Up Log

1) Place two bottles under sealer with conveyor stop and Enercon system switched off
2) Place Enercon "Sealing Head to Cap Gap Gage" on top of bottles with caps on
3) Lower sealing head so it just touches the gap gauge
4) Verify sealing head is level
5) Set power level for container
6) Run test bottles to verify acceptable seal

<table>
<thead>
<tr>
<th>Product</th>
<th>Bottle Size</th>
<th>Cap Size</th>
<th>Conveyor Speed</th>
<th>Air Gap</th>
<th>System</th>
<th>Power Level</th>
<th>Initials</th>
</tr>
</thead>
</table>

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Achieve a Perfect Seal
Record Data

Determine at what output % the best seal is achieved. Repeat for all cap/container configurations

- Container details
- Closure details
- Liner material details
- Closure application torque
- Conveyor speed
- Sealing head air gap
- Output %
Recording Data Options

Some data can also be recorded on board the sealer

![Modify Recipes](image)
How to determine if you have a good seal?
Determining a Good Seal

ASTM Guideline
- No specific guideline for induction seal integrity
- There are guidelines for leak tests

Most companies create their own definition of a good seal though various testing methods
Good Seal Characteristics

Good adhesion on the entire circumference

Minimum Wrinkling

No discoloration indicates proper output level
Good Seal Characteristics

Foam backed liners should have their foam still intact.
2 piece liners will show no darkening of the pulpboard.
Determining a Good Seal

Vacuum (Wet or Dry)
Shipping
Vision systems
Mechanical pressure
Shake, Squeeze or Stand!
Determining a Good Seal

Enercon uses a vacuum leak detector
  – in conjunction with customer specification

When should you test?
  – Immediate hermetic seal
  – Seal strength changes over first 24 hours
Troubleshooting Tips from the Pros
Troubleshooting

A detailed explanation of the issue begins with identifying the problem. First question to ask “Is the problem consistent?”

Types of problems

- No Seal
- Partial Seal
- Overheated Seal
- Inconsistent Seals
The #1 Cause for poor seals

Torque! Torque! Torque!

Inconsistent or insufficient application torque accounts for 80% of all problems.

<table>
<thead>
<tr>
<th>Cap Size (mm)</th>
<th>15</th>
<th>18</th>
<th>20</th>
<th>22</th>
<th>24</th>
<th>28</th>
<th>33</th>
<th>38</th>
<th>43</th>
<th>48</th>
<th>53</th>
</tr>
</thead>
<tbody>
<tr>
<td>Torque (inch/lbs)</td>
<td>6 to 9</td>
<td>7 to 10</td>
<td>8 to 12</td>
<td>9 to 14</td>
<td>10 to 16</td>
<td>12 to 18</td>
<td>15 to 25</td>
<td>17 to 26</td>
<td>18 to 27</td>
<td>19 to 30</td>
<td>21 to 36</td>
</tr>
</tbody>
</table>
Your seals are trying to tell you something!
No Seal

Is the sealer turned on?
Was there a liner in the cap?
Does all of your current set-up data match your operating window documentation?

• What may have changed?
  – Line speed?
  – Container Resin?
  – Liner Material?

Application torque
Partial Seal

Output too low/line speed too high
Not centered
Low Application torque
Cocked cap
Cap bottoms out
Saddle in land area
Ridge in land area
Under heated seal

Output too low/line speed too high

Liner material will does not adhere properly

Seal that lets go under light pressure to no adhesion

On 2 piece liners there may also be a swirling pattern or poor wax absorption
Overheated seal

Output too high
Line speed too slow
Wrinkling/odor
Pulp board discoloration/burning
Cocked cap
Other considerations

- Materials - bottle & liner supplier changes
- Closure / Liner Storage
- Inconsistent Speed
- Poor bottle & cap match
Troubleshooting

Closure information

– Cap supplier, size and style.
– Tracing information.
  • Lot #, Pallet #, Job or Order #, Roll Serial #
  • Each box of closures should be traceable to each unique roll of material thru the Roll Serial #.

Bottle supplier, material and mold numbers
Troubleshooting

Induction Sealer

– Unit Make and Model
– Type of sealing head coil. (tunnel, flat, skewed)
– Induction settings (power level, air gap)

Application info

– New or existing application?
– Product being filled and filling conditions
– Line speed
– Application Torque
5 Secrets to Achieving a Perfect Seal

- Document Results
- Optimize Materials & Equipment
- Heat Pressure Time
- Operating window
- TORQUE!

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Questions & Answers

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Thank you