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Henkel Adhesive Technologies

WHITE PAPER

HEAT SEAL COATINGS FOR FLEXIBLE PACKAGING

Heat seal coatings for lidding, blister and flexible packaging solutions help to protect the contents of package, as well as consumers and the environment.

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Globally relevant content

CONTENT

What are heat seal coatings?

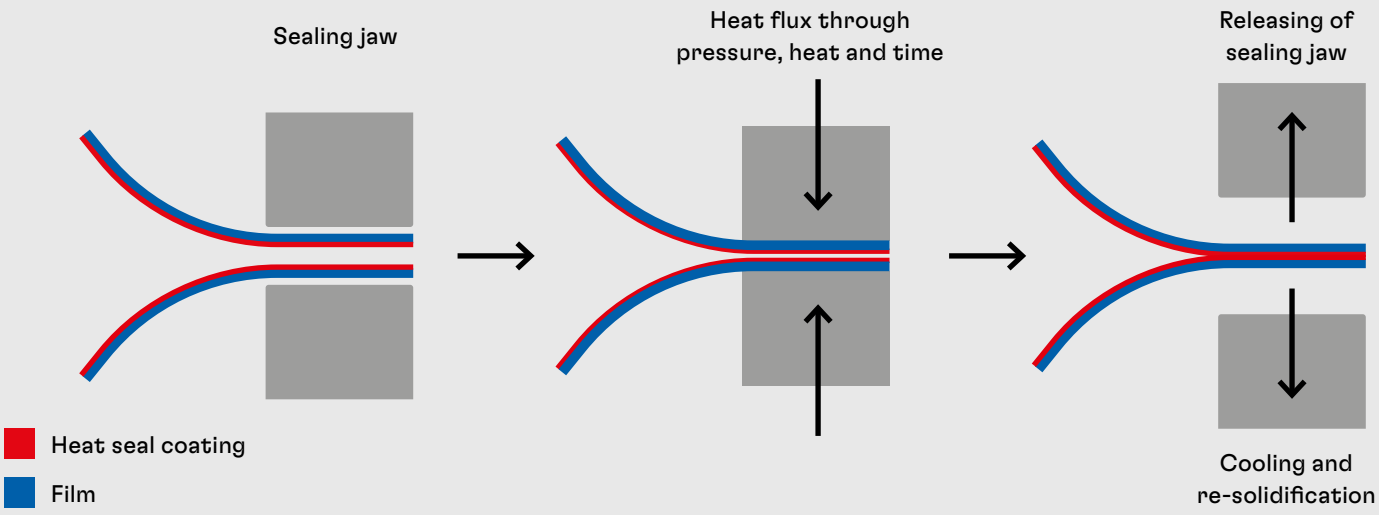
Definition

Heat seal coating technologies involve a process that unites two or more surfaces using heat, pressure and time to make a seam, closure or attachment.

Process

To form a seal, the required amount of heat flux must be guaranteed for the sealing layer to reach its transition temperature before it cools down and re-solidifies. As illustrated in the diagram below, the substrates undergo three basic steps ❶ two sealable substrates get fed into the sealing equipment ❷ hot sealing jaws apply pressure for an appropriate length of time ❸ the layers get released by the sealing jaws, then they cool down and re-solidify.

Mechanism of heat seal formation
Figure 1



What are the heat sealing technologies?

Explore the sealing technologies

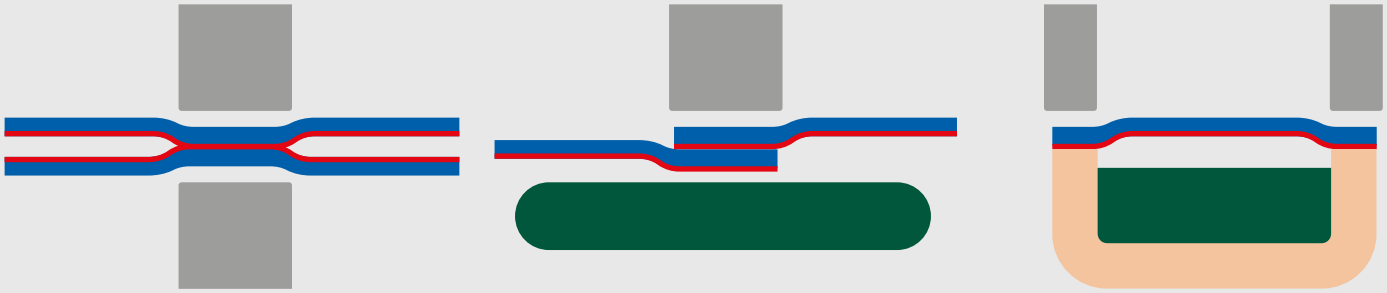
Customers today have a clear concept of which specific properties they need from their packaging. Therefore, all of our coating solutions have one thing in common: They meet the high expectations and demands of the market. This means customers simply need to select the right heat seal technology that suits their unique packaging needs. Henkel's experts can help you select the right coating based on the desired performance.

The heat seal can be applied with different media and application techniques: 1 Heat seal hot melt – a solid form applied by extrusion or heated roller and 2 Heat Seal coatings – applied from a water-based or solvent-based product. These heat seal coatings are smooth peelable or locked sealed, depending on the needs of the packaging and the filling good.

Heat seals can be applied on different substrates like plastic films, aluminum foil and paper. These seals are designed to seal together mono or multiple materials.

Heat seals are applied at a low coating weight and have a low initial sealing temperature. This provides optimal welding with high transparency. Moreover, a heat seal can be created using three different sealing technologies illustrated below:

Three sealing technologies
Figure 2



Heat seal coating
Film
Filling good
Packaging material

A to A
The coating is sealed against the coating. Both coated sides of the substrates get in contact and the coating on one side sticks to the coating of the other side.

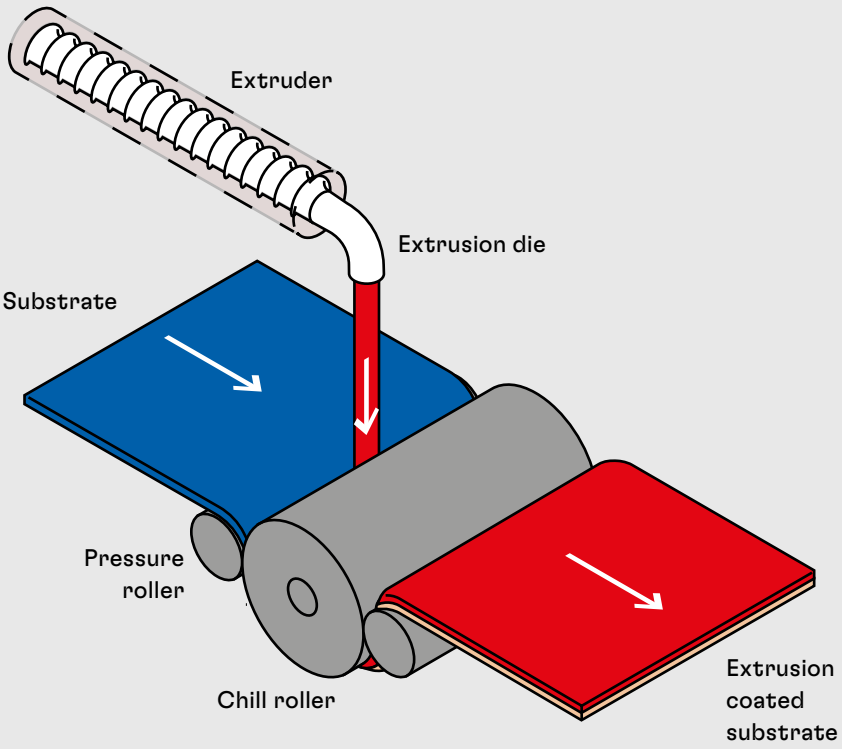
A to B
The coating is sealed against the back side of the non coated material.

A to Rigid
The coated substrate is sealed against a rigid counterpart (such as sealing a lid on a plastic cup or glass jar).

Heat seals bond two or more layers, achieving peelable and high strength bonds – and anything in between. The coatings can be adapted to most needs by choosing the right chemistry, application method, substrates and heat seal conditions. By using heat seal technology, it is even possible to join materials that are often viewed as incompatible.

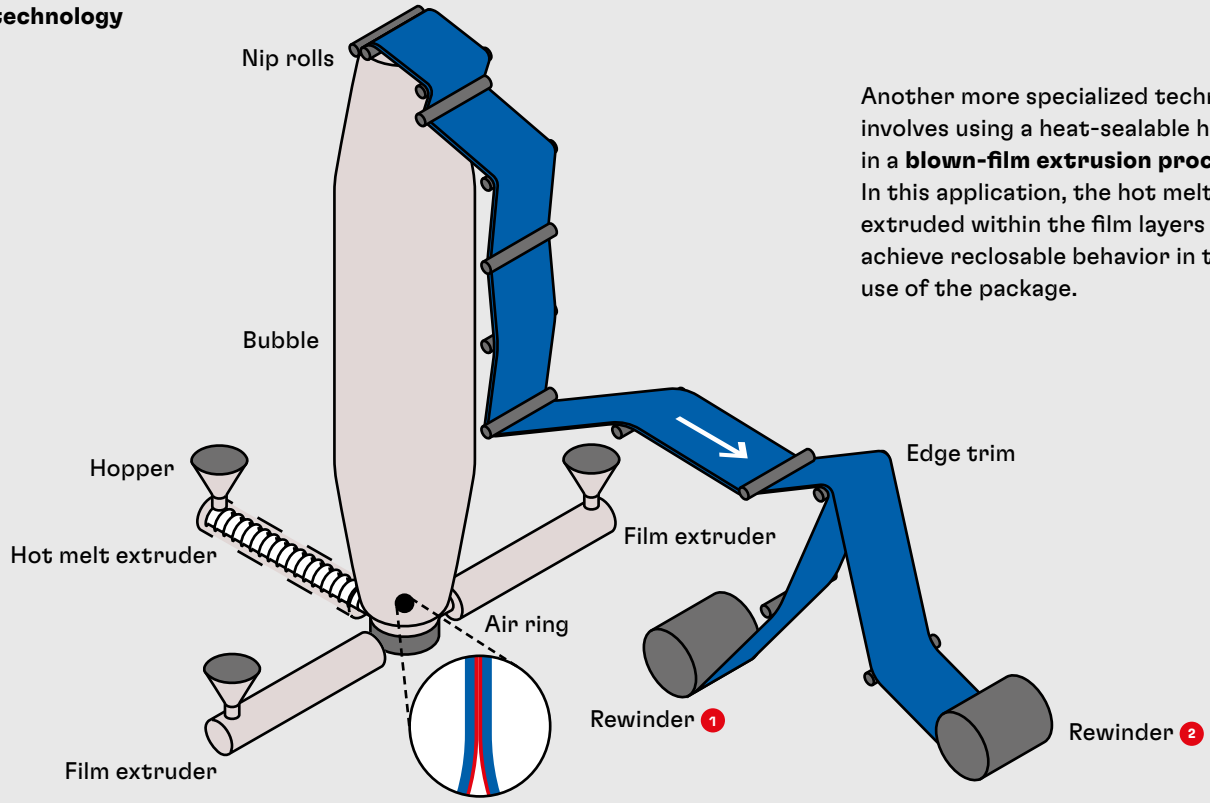
What are heat seal coating applications?

Hotmelt technology
Figure 3



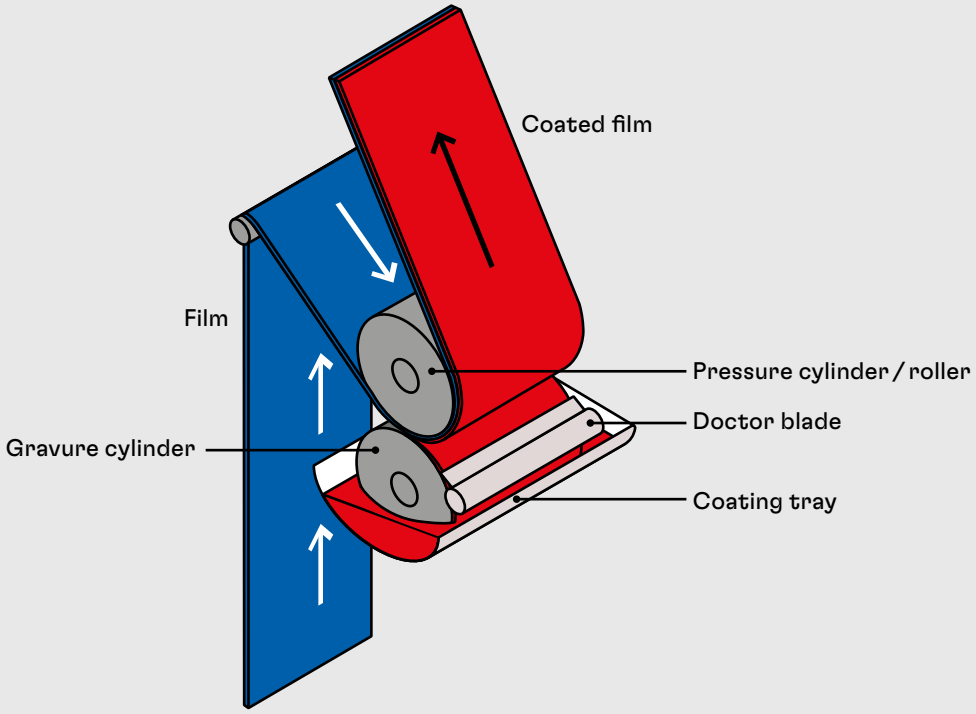
The heat-sealable **hot melts** can be applied by various methods. **One method involves solid extrusion.** As shown on the diagram, the product is fed into commonly available application equipment by an extruder and can be applied directly onto the substrate via extrusion die, roller, nozzle / slot nozzle or curtain coating. Usually, a chill roller is used afterwards to cool down the hot melt and support re-solidification.

Blow film technology
Figure 4

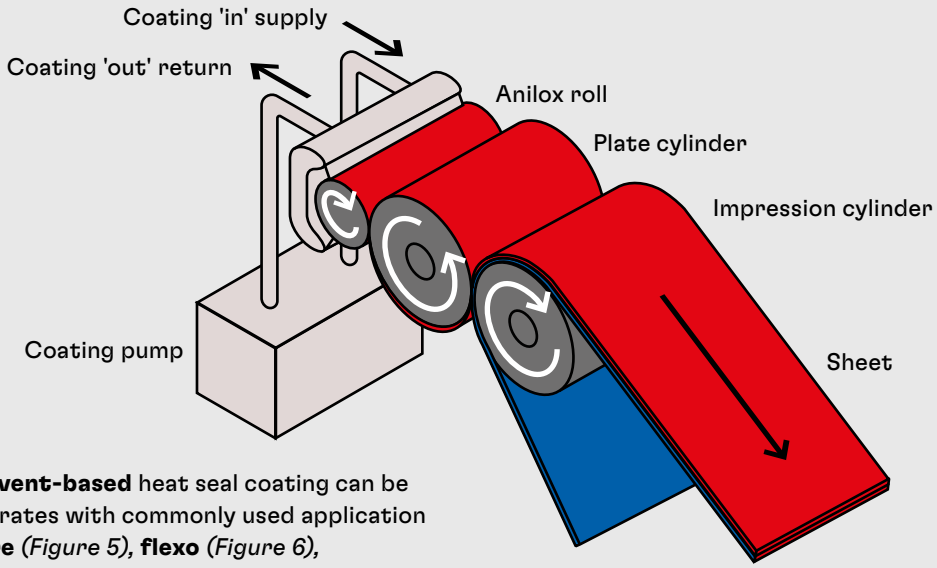


Another more specialized technology involves using a heat-sealable hot melt in a **blown-film extrusion process.** In this application, the hot melt is extruded within the film layers to achieve reclosable behavior in the end use of the package.

Gravure technology
Figure 5



Flexo technology
Figure 6



The **water-based** or **solvent-based** heat seal coating can be applied on various substrates with commonly used application technologies like **gravure** *(Figure 5)*, **flexo** *(Figure 6)*, semiflexo or rod.

Typical machines in this market are printing, lamination or specific coating lines.

After applying heat seal, the carrier web (such as aluminum foil, paper or a plastic film) is transported into the drying tunnel where the water or the solvent evaporates due to an air stream and temperature. After the drying process, the coated substrates can be re-winded for further process steps—like cutting and packaging.

In some cases, heat seals are also applied inline in combination with the ink printing process.

Where are heat seal coatings used?

Heat seal coatings are the most flexible joining method in flexible packaging, with a wide range of seal strength and compatible substrate possibilities. This makes them suitable for numerous applications—from yogurt and dairy lidding through to oven-able trays, paper pouches, credit cards and pharma blisters. They are designed for solvent-based, water-based and hot melt applications.

Food

- Lidding non-foil cups such as film and film / paper (e.g. dairy, yogurt)
- Lidding foil capsules (e.g. coffee)
- Lidding foil glass jars (cups, peelable)
- Lidding film cups (e.g. dairy, yogurt)
- Lidding film peelable (e.g. fresh food and ready meal)
- Film pouches
- Paper pouches (e.g. tea bags, confectionary, sugar)

Non-food

- Paper pouches / wraps (e.g. hardware, cement, tissue roll)
- Cards

Medical

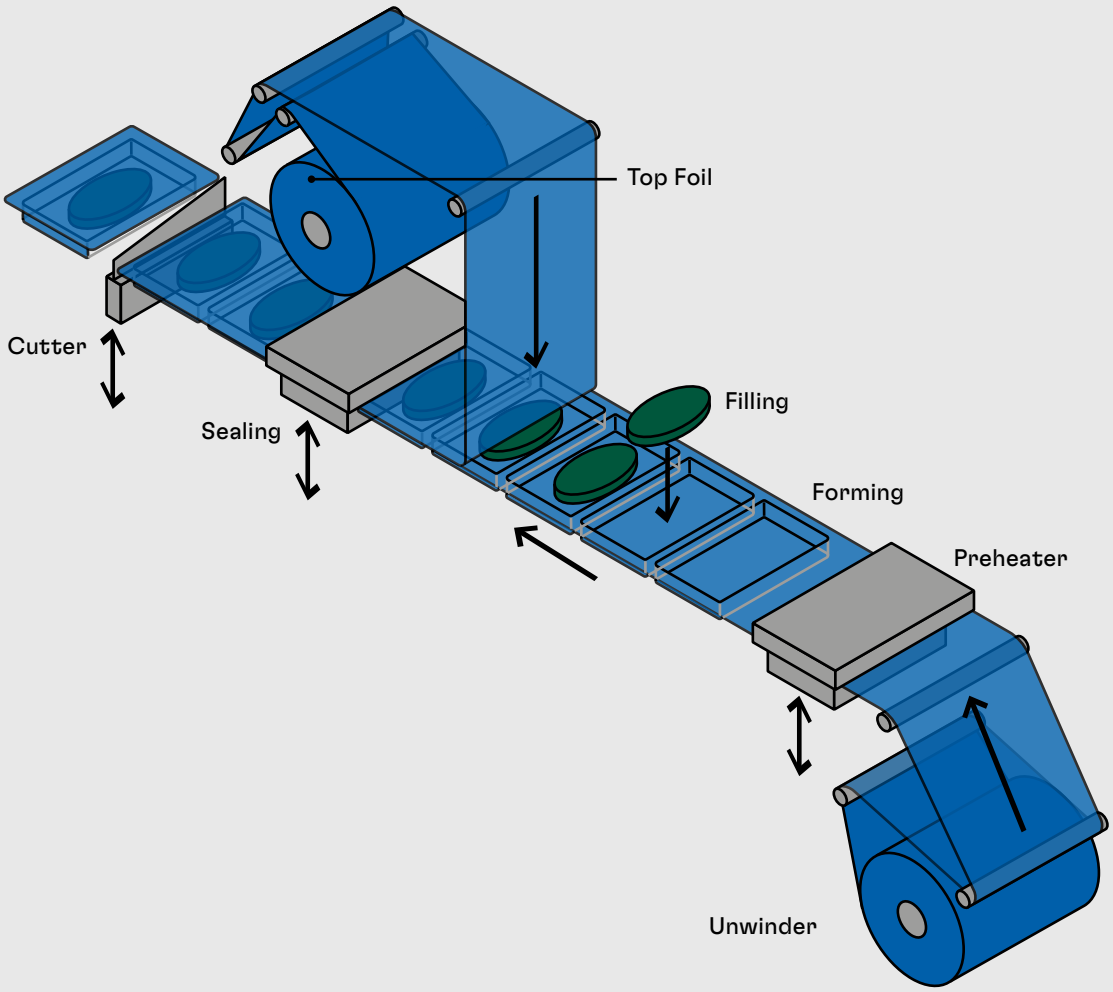
- Pharma blisters
- Sterile pouches

Benefits of heat seal coating technologies

Most flexible joining method

1. **Classical sealing with heat:** The upper bar or plate is heated and moved. The lower bar is fixed and is not heated – it is only used for fixation (e.g. dairy lidding for cups, menu trays) *(Figure 7)* Both bars are heated for pouch sealing of packaging.
2. **Inductive welding (caps):** No hot bars are used. Instead, the heat is introduced by passing an induction coil that emits a varying electromagnetic field.
3. **Ultrasonic welding:** No hot bars are used. Instead, the heat is introduced by mechanical friction caused by ultrasonic waves at the contact area of the two substrates *(Figure 8).*

Thermoforming vacuum packaging machine
Figure 7



Coating can be adapted to most needs

Packaging producers can choose the most suitable chemistry, application method and heat seal temperature for their specific layer type and filling goods.

Seal from peelable to permanent

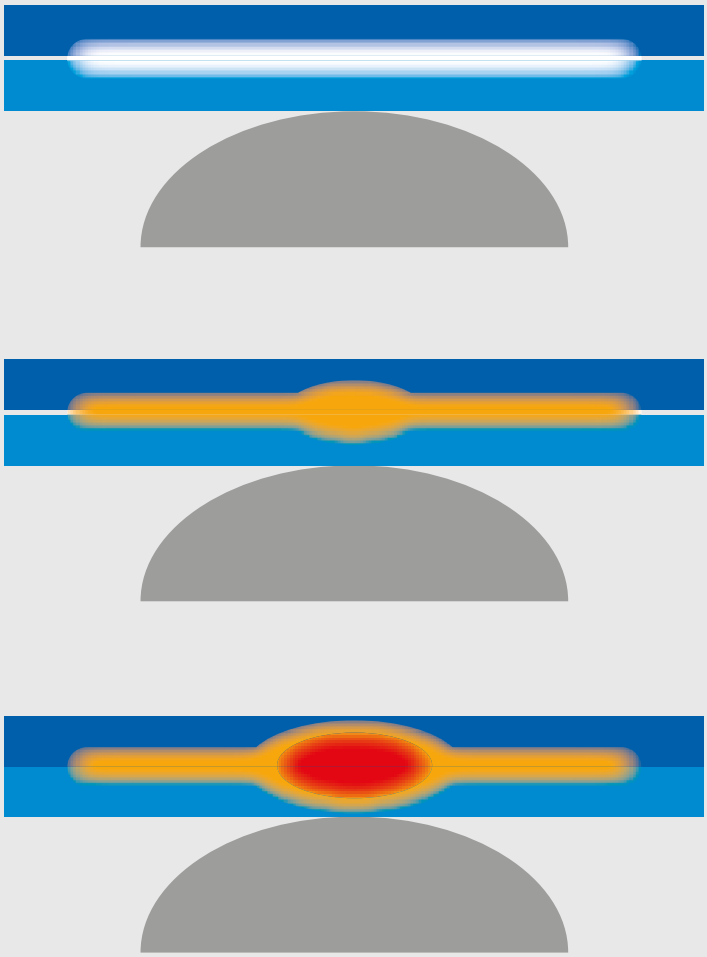
Lidding packaging is used to make yogurts and ready meals easy to open by hand. Lockseal sealing, lidding or flow pack packaging are applied for the packaging of products that are not designed for easy tear and where the sealed layers need to be cut for opening. Examples include juice pouches, pharma blisters or coffee capsules.

Ultrasonic Welding

Figure 8

Film 1

Film 2



1 Phase
The Sonotrode moves onto the still cool foils and introduces the ultrasonic waves.

2 Phase
The anvil focuses the energy, and heat is generated within the foils with pinpoint accuracy.

3 Phase
The films melt and are joined by additional pressure.

Tips from our Henkel experts

Five tips from our experts in heat seal applications.

1 How to successfully switch from plastic to paper?

- ☐ Define proper packaging requirements, including recyclability.
- ☐ Use the best combination of paper, heat seal technology and application method.

2 How to prevent blocking?

- ☐ Dry the coating surface.
- ☐ Cool down before rewinding.
- ☐ Use the lowest effective rewinding tension.
- ☐ Ensure suitable storage and transport conditions.

3 How to achieve a smooth surface?

- ☐ Select the proper application technology with a correctly adjusted dilution for the specific substrate involved.
- ☐ Apply a proper drying oven profile (temperature, air flow, machine speed).

4 How to get good adhesion to substrates?

- ☐ Select a suitable combination of the substrate and the heat-seal coating.
- ☐ Inline treatment supports a cleaned surface of the film.
- ☐ Correct drying of the coating is essential.
- ☐ Peak material temperature is relevant to achieve good adhesion and filling good resistance.

5 How to dry efficiently?

- ☐ Use a suitable ramp-up temperature for the coating technology, substrates and machine design.
- ☐ Ensuring a correctly adjusted airflow will support the drying behavior and avoid skinning or trapped air.
- ☐ All adjustments must correlate with the targeted machine speed.

About Henkel

With its brands, innovations and technologies, Henkel holds leading market positions worldwide in the industrial and consumer businesses. The business unit Adhesive Technologies is the global leader in the market for adhesives, sealants and functional coatings. With Consumer Brands, the company holds leading positions especially in laundry & home care and hair in many markets and categories around the world. The company's three strongest brands are Loctite, Persil and Schwarzkopf. Sustainability has a long tradition at Henkel, and the company has a clear sustainability strategy with specific targets. Henkel was founded in 1876 and today employs a diverse team of about 47,000 people worldwide – united by a strong corporate culture, shared values and a common purpose: "Pioneers at heart for the good of generations." More information at www.henkel.com.

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Thank you.

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