

# Hotmelt Application Guide

## Application Technology and Troubleshooting



Excellence is our Passion

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3. Requirements for a Good Bond
4. Application Issues and Potential Solutions
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  3. Liquid Stage Bond Failure
  4. Partial Fibre Tear
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  6. Degradation
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# Health and Safety

- » Avoid any skin contact with hotmelt adhesives and equipment
- » Make sure you always wear personal protective equipment when working on or near Hotmelt units
  
- » In case of burn:
  - Immediately cool down with cold water for a minimum of 15 minutes
  - Treat as a wax or resin type burn
  - Do not attempt to remove solidified adhesive
  - In case of a serious burn seek medical attention



# Health and Safety

## FUMES

Vapour and fumes at recommended application temperatures are minimal and non toxic. However to some individual they can irritate the respiratory system, but not considered harmful

» LTEL\* level 5 mg/m<sup>3</sup>

## FIRE HAZARDS

Conditions to avoid: overheating, direct contact with naked flame, electrical sparks and static discharge

» Stay within the recommended temperature setting according to MSDS (Material Safety Data Sheets)

\* long term exposure limit

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# Protect your Hotmelt Unit

- » Top up little and often
  - Always keep the tank filled to a minimum 75% capacity
- » WHY?
  - Oxygen combined with heat will causes the adhesive to degrade
  - If you fill with too much fresh adhesive, you will decrease the temperature in the tank and increase the viscosity (stringing)

# Protect your Hotmelt Unit

- » Keep the tank closed to protect from dust and board fibres contaminating the adhesive
- » Keep adhesive containers covered as well
- » Do not use spilled adhesives
- » Ensure that the adhesive containers and tanks are protected from water if the machines are cleaned down. Water will cause foaming and splashing in the tank when in contact with melted adhesives

# Glue Bead and Pressure Setting

- » The application of a consistent bead of hotmelt not only means that costs are contained but the adhesion is maintained
- » Based on our experience the uncompressed glue bead should typically be:
  - Cartons: 1.5 – 2 mm wide
  - Cases: 2.5 – 3.5 mm
- » Adhesive pressure should typically be 2 – 3 bar

# Summary

- » Wear personal protective equipment
- » Always keep the tank 75% of tank capacity
- » Do not mix with other products
- » Close the lids on pots
- » Close the adhesive containers
- » Avoid dust
- » Keep the temperature within the recommended range
- » Control the equipment

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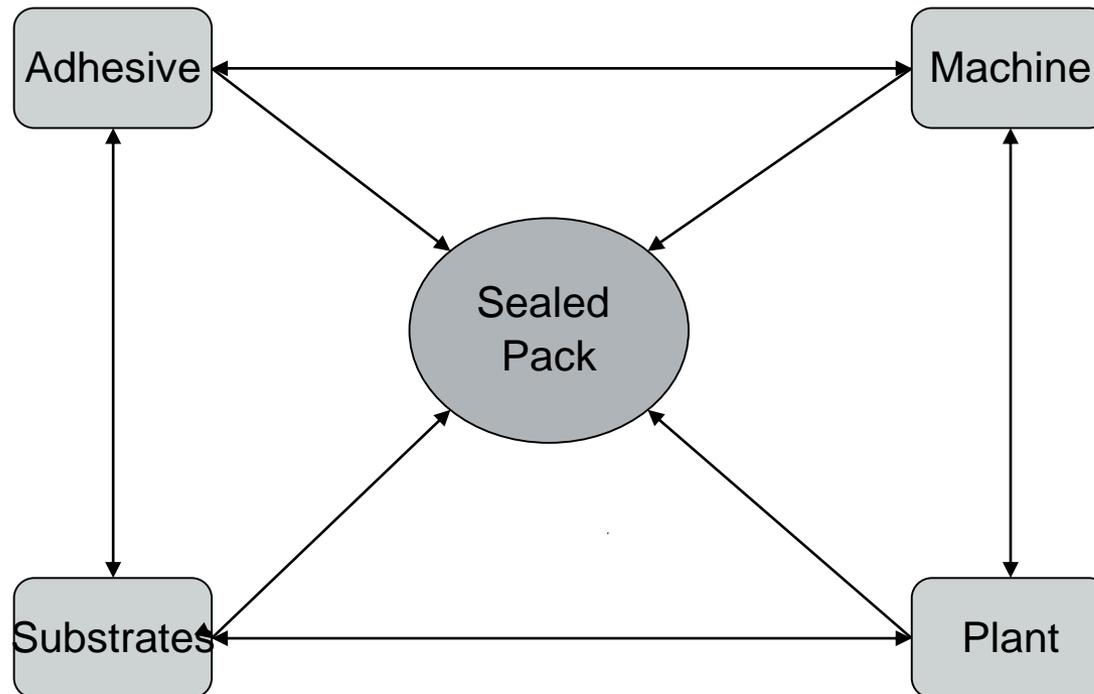
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# Selecting Suitable Technology

- » Selecting the right adhesive for a specific application depends on a number of criteria to achieve a secured sealed pack



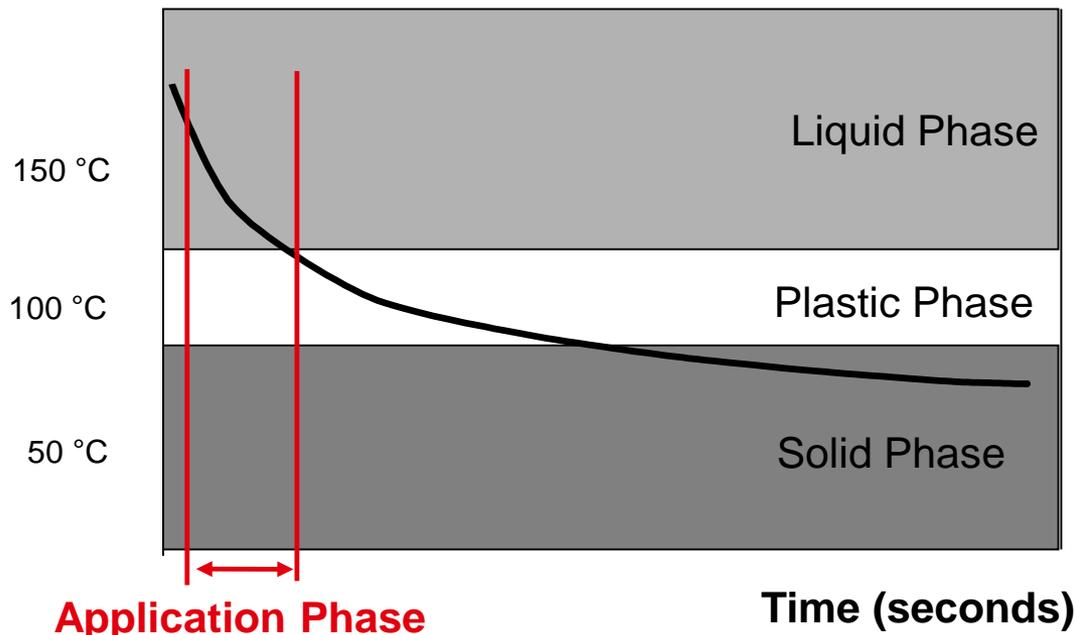
# Selection Criteria for Hotmelt Adhesives

- ✓ Right level of adhesion for the substrate
- ✓ Right properties for the different machines  
*E.g. set time, open time*
- ✓ Viscosity
- ✓ High hot tack
- ✓ Temperature performance  
*Window needed (export to hot or cold countries?)*
- ✓ Thermal stability
- ✓ Odour
- ✓ Approval for food packaging

# Requirements for a Good Bond

- » Hotmelt adhesives are solid at room temperature and becomes liquid at elevated temperatures
- » The hotmelt has to be applied hot and in liquid phase in order to wet the substrate and create a good bond

Temperature



# Requirements for a Good Bond

- » Apply the hotmelt to correct place
- » Apply just enough adhesive
- » Adhesive must wet out the substrate
- » Adhesive must be liquid when substrates are brought into intimate contact
- » Substrates must be held together until a bond has formed
- » Temperature and humidity of factory and substrates affect the adhesives setting time
- » Keep adhesive and applicator clean at all times

# Requirements for a Good Bond

An adhesive is has a specific end use

» If you change :

- the substrates,
- the environment of the machine,
- basic requirements of the finished product or
- the machine

▶ **Consult your Henkel contact whether you need to change the adhesive to match the new requirements**

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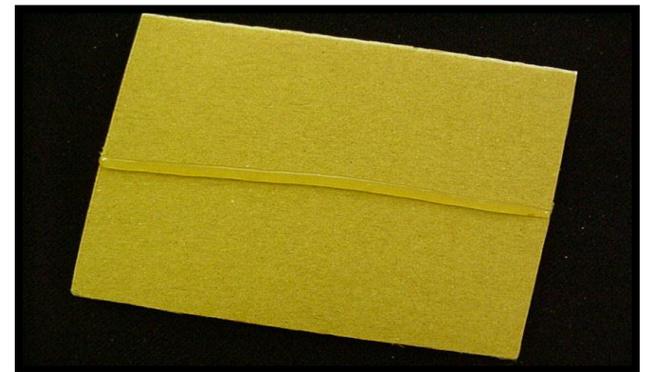
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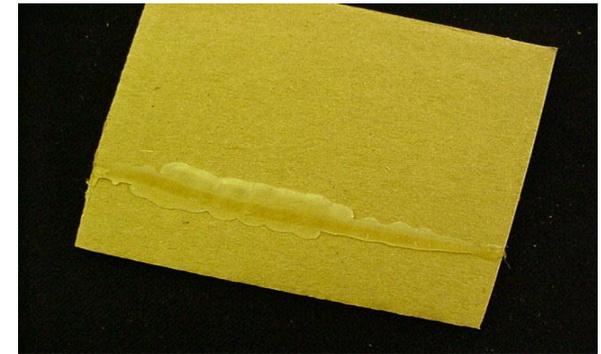
# 4.1 Uncompressed Adhesive Bead

- » Adhesive is 'glossy' in appearance and is only on the surface to which it is applied:
- **Insufficient adhesive applied to give the required open time**
    - Need to apply more adhesive
  - **Adhesive temperature is set too low to give the required open time**
    - Need to adjust the temperature
  - **Bead did not make contact with the other surface**
    - Need to check compression



## 4.2 Plastic Stage Bond Failure

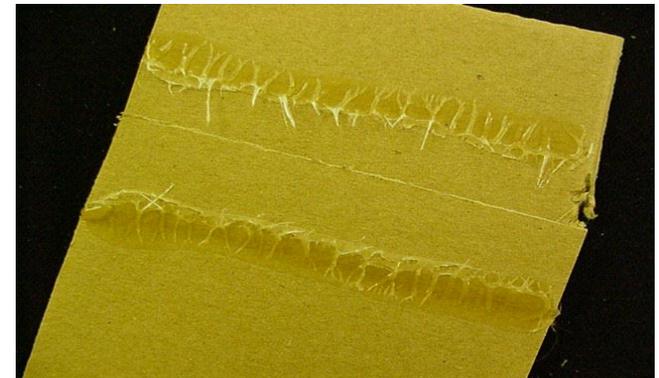
- » Adhesive has a matt finish and is only on one surface, but has flattened out when compressed. The adhesive will not 'wet out' and bond the substrate:
- **Compression took place as the adhesive was in its 'plastic' stage**
  - Check that the running temperature is not too low
  - Apply more adhesive to increase the open time
- **Adhesive will not bond to this substrate**
  - Need to check that the substrate has not changed and also check the adhesive



## 4.3 Liquid Stage Bond Failure

» Adhesive is 'glossy' in appearance and is on both surfaces. The adhesive bead has not set before leaving the machine compression section:

- **Too much adhesive is being applied**
  - Reduce the amount of adhesive applied
- **Adhesive temperature is too high**
  - Check temperatures and reduce to those recommend on the data sheet
- **Insufficient or excessive compression**
  - Increase the compression pressure or check machine set up



## 4.4 Partial Fibre Tear

- » Fibre tear only occurs in parts along the adhesive bead width:
  - **Not enough compression – bond starts to fail when pack exits the compression stage**
    - Check that even compression has been applied
  - **Too much adhesive has been applied**
    - Reduce the amount of adhesive applied



# 4.5 Adhesive Squeeze Out

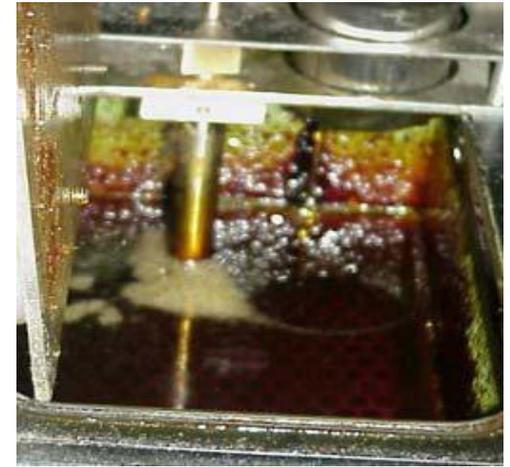
» Adhesive appears on the outside of the flap:

- **Too much adhesive has been applied**
  - Reduce the amount of adhesive applied
- **Bead is too close to the edge of the flap**
  - Adjust timing or reposition the applicator
  - Adhesive should be positioned 1-2 cm from the edge of the case



## 4.6 Degradation

- » Hotmelt adhesives can degrade if not used properly
- » Oxygen combined with heat will cause an adhesive to degrade over time
  
- » Degradation is shown by one of the following effects: darker colour; black charred particles in the adhesive; thickening or gelling; excessive fuming
  
- » Prevent degradation by:
  - Always keeping the tank filled to a minimum of 75% of capacity
  - Ensure tank temperatures are set as recommended
  - Use set back (stand-by) temperatures or turn tanks off during periods of prolonged machine down time



# 4.7 Stringing

- » Can build up on the machine causing frequent stoppages and lost production
- » It can also contaminate the substrates
  
- » Minimise stringing by:
  - Ensuring running temperatures are not too low
  - Checking substrates are not too cold
  - Ensuring the adhesive is not too thick. Evaluate lower viscosity grades if necessary
  - Checking the timing of guns
  - Ensure the applicator is not too far away from substrate
  - Check the applicator shut off. Adjust or replace applicator if necessary
  - Ensure the correct nozzle size is being used for optimal application



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# Hotmelt Packaging Adhesive

**Problem:** Adhesive chars or gels in the melting tank

| Possible causes  | Remedy  |
|--|---|
| 1. Actual temperature of the melting tank is far above the temperature recommended by the adhesive producer. | a) Lower temperature<br>b) Check temperature controller and have it regulated if faulty   |
| 2. Adhesive is left at the application temp.for long periods of time.  | a) Turn off hotmelt unit or use a setback mechanism.<br>b) Use a premelter where the bulk of the molten Hotmelt is kept at a lower temperature before use |
| 3. Adhesive oxidizes through contact with air  | a) Keep tank covered.<br>b) Protect with inert gas<br>c) Use adhesive with higher stability against oxidation and heat                                    |

# Hotmelt Packaging Adhesive

**Problem:** Adhesive strings during application

| Possible causes  | Remedy  |
|--|---|
| 1. Nozzle is dirty or does not operate properly            | Clean nozzle or have it repaired  |
| 2. Ambient temperature is too low due to air draught, e.g. | Improve environmental conditions  |
| 3. Substrate too cold.                                     | Preheat substrate   |
| 4. Distance between nozzle and substrate is too long       | Minimize distance between nozzle and point of application   |
| 5. Application temperature of the adhesive is too low      | Increase processing temperature   |
| 6. Viscosity of the adhesive is too high                   | Choose lower viscosity adhesive if raising of the processing temperature cannot be carried out for any reason |
| 7. Adhesive tends to string.                               | Use hot air fan or heating wire if selected adhesive cannot be substituted                                    |

# Hotmelt Packaging Adhesive

**Problem:** Adhesion is all right, but cohesion is inadequate (cohesion failure)

| Possible causes  | Remedy  |
|--|---|
| 1. Setting time too long   | <ul style="list-style-type: none"> <li>a) Reduce processing temperature</li> <li>b) Reduce application amount</li> <li>c) Increase compression time</li> <li>d) Lower temperature of the substrate</li> <li>e) Choose an adhesive with a shorter setting time or higher initial tack (hot tack)</li> </ul>      |
| 2. Application amount too small.   | <ul style="list-style-type: none"> <li>a) Increase application weight by</li> <li>b) Broadening the adhesive bead (higher pressure, bigger nozzle),<br/>or</li> <li>c) Extending the adhesive bead</li> <li>d) Shifting the Hotmelt line away from the fold</li> <li>e) Applying more adhesive lines</li> </ul> |
| 3. Insufficient compression of glued surfaces  | <ul style="list-style-type: none"> <li>a) Increase pressure</li> <li>b) Apply the adhesive where pressure is sufficiently high</li> </ul>   |
| 4. Glued surfaces are shifting during setting process.                                       | Check the compression station and make sure that it is in square.   |
| 5. Memory force is too great, which can be recognized by glue strings formed during setting. | <ul style="list-style-type: none"> <li>a) Apply more pressure</li> <li>b) Increase adhesive weight (see I.2)</li> <li>c) Shift adhesive line further away from the fold</li> </ul>  |

# Hotmelt Packaging Adhesive

**Problem:** Insufficient adhesion to second substrate

| Possible causes   | Remedy  |
|---|---|
| 1. Inadequate contact of the surfaces which can be recognized by the non completely pressed adhesive line.                                      | a) Optimize compression conditions<br>b) Apply adhesive where counter-pressure is sufficient  |
| 2. Adhesive amount is too small or adhesive line is too thin, although substrate failure (fibre tear) can be observed.                          | Increase application weight to overcome memory forces   |
| 3. Open time is too short which can be recognized by the smooth, glossy surface of the adhesive or its insufficient penetration into substrate. | a) Increase application temperature<br>b) Have temperature controller or heating system checked, when set and actual temperature do not correspond<br>c) Avoid air draft<br>d) Preheat material by infrared radiation or hot air<br>e) Shorten time between adhesive application and applying pressure, or increase machine speed<br>f) Increase application amount of the adhesive<br>g) Choose adhesive with longer open time<br>h) Increase pressure to create intimate contact of the substrates to be bonded |

# Hotmelt Packaging Adhesive

**Problem:** Insufficient adhesion to second substrate

| Possible causes   | Remedy   |
|---|--|
| <p>4. Difficult-to-bond material (e.g. glossy, smooth surface by lacquering preventing necessary anchorage of adhesive film in substrate; migration of volatile matter to interface; poor wetting due to low surface tension, especially in case of PE or PP coating)</p> | <ul style="list-style-type: none"><li>a) Block glue flap from coating where adhesive is to be applied</li><li>b) Increase surface tension by appropriate treatment</li><li>c) Apply higher application temperature for better wetting or melting the thermoplastic PE or PP surface</li><li>d) Choose adhesive with higher tackiness (softer or more elastic grade)</li><li>e) Change substrate if wetting is poor and measures a – d cannot solve problem</li></ul> |

# Hotmelt Packaging Adhesive

**Problem:** Irregular adhesive application; imprecise direction of spraying

| Possible causes  | Remedy  |
|--|---|
| 1. Heating system or temperature controller of the melt tank/hose/application head or solenoid valve is out of order | Have equipment checked  |
| 2. Filter or nozzle clogged  | a) Clean and/or replace filters on a regular schedule<br>b) Check for foreign material in hotmelt tank and in hotmelt containers<br>c) Use adhesive with higher thermal stability |
| 3. Pressure too low.   | Increase pressure   |
| 4. Nozzle too small  | Use larger nozzle   |

# Hotmelt Packaging Adhesive

**Problem:** Adhesive sprays out from adhesive bead

| Possible causes   | Remedy         |
|-------------------|----------------|
| Too high pressure | Lower pressure |

**Problem:** Bubbles in the adhesives

| Possible causes   | Remedy  |
|---|---|
| 1. Local overheating and thermal decomposition                                  | a) Check and regulate the temperature<br>b) Clean applicator in case of contamination |
| 2. No adhesive in the tank  | Refill pot and clear the supply hose  |
| 3. Viscosity of the adhesive is too high in case of wheel or roller application | a) Increase temperature<br>b) Use lower viscosity adhesive                            |
| 4. Adhesive contains too much moisture  | Make sure the adhesive has no moisture on it  |
| 5. Air entrapped during melting process   | Increase temperature of the tank to drive off air bubbles                             |



# Henkel



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