THE POWER OF PAPER

PAPER SOLUTION FOR THE THERMAL PACKAGING MARKET

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BASIC THEORY OF THERMODYNAMICS

**Conduction**
- Temperature gradient
- Heat transfer
- R-value

**Convection**
- Temperature gradient
- Between surface and gas
- Air leakages

**Radiation**
- Heat waves
BASIC COMPONENTS

Packing with a lot of variables

Phase Change Materials (PCM)

Insulation

Product
WHOM TO TARGET?

• Food and beverages
  • Highest growth rate
  • Less than 48 hours
  • Highly competitive market
• Cosmetics
• Industrial
• Pharmaceuticals: low end

Look for the easy opportunities first
<table>
<thead>
<tr>
<th>TEMPERATURE RANGE</th>
<th>AMBIENT</th>
<th>CHILLED</th>
<th>FROZEN</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Temperature 15°C / 25°C</td>
<td>Temperature 2°C / 8°C</td>
<td>Temperature -18°C / 0°C</td>
</tr>
<tr>
<td>Customer profile</td>
<td>Exceptions</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
TRUST BASED ON:

- R-value laboratory test
- ISTA climate profiles
- Climate chamber tests
- Packaging engineering
- Test reports available
- Experiences in USA/Europe
## Initial test results

<table>
<thead>
<tr>
<th>Product</th>
<th>R-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>WrapPak</td>
<td>1.6</td>
</tr>
<tr>
<td>WrapPak (3 layers)</td>
<td>4.8</td>
</tr>
<tr>
<td>WrapPak (4 layers)</td>
<td>6.5</td>
</tr>
<tr>
<td>PadPak JR</td>
<td>2.7</td>
</tr>
<tr>
<td>Foil Bubble (3/16”)</td>
<td>1.1</td>
</tr>
<tr>
<td>EPS 1” Panel</td>
<td>4.2</td>
</tr>
<tr>
<td>EPS Cooler 1,5”</td>
<td>6.3</td>
</tr>
</tbody>
</table>

Tests are inseparably part of the sales process.
THERMAL PACKAGING

HIGHLIGHT OF THE ADVANTAGES

• Green: Sustainable, Recyclable, Biodegradable
• Space Savings
• Total costs reduced
• Image/Branding
• Damages lower
  • Temperature Related Damages
  • Physical Shipping Damages
• Food Contact Safe
Physical protection

HORNA OFFERING
VOID FILL

Reduction conduction
HORNA OFFERING CUSHIONING

- Vulnerable products
- Smaller boxes
- Insulating value
Protection

Fragile products

Unboxing experience

HORNA OFFERING GEAMI
EXPERIENCES EUROPE (1)

• Meal supplier
  Chilled (2-8°C)

• Online supermarket for specialties
  Chilled (2-8°C)
EXPERIENCES EUROPE (2)

• Cake decoration chocolate
  Ambient (15-25°C)

• Diet food
  Frozen (<0°C)
EXPERIENCES EUROPE (3)

• Raw dog food
  Frozen (<0°C)

• Vegetarian food
  Frozen/Chilled/Ambient
  (-5°C/2-8°C/15-25°C)
EXPERIENCES EUROPE (3)

• Spanish gourmet food
  Chilled (2-8°C)

• Online supermarket
  Chilled (2-8°C)
EXPERIENCES EUROPE (4)

• Frozen dog food

Frozen <0°C
Sample testing (1)

• Organic drinks
  Chilled (2-8°C)

• Meal supplier
  Chilled (2-8°C)
Sample testing (2)

- Meat/cheese
  Chilled (2-8°C)

- Meal supplier
  Chilled (2-8°C)
Process analysis

- Leading online meat supplier
- Frozen (<0°C) and chilled (2-8°C)
- 10-12,000 boxes per week
- Sample testing
- Total cost of ownership
WRAPPAN PROTECTOR

• Flexible
• Versatile
• Cost effective
• Easy handling and operation
FLEXIBLE AND VERSATILE

- Box lining
- Block & Brace
- Interleaving
- Wrapping
- Insulating
COST EFFECTIVE

- Less material needed
- Easy handling
- Fast
EASY HANDLING AND OPERATION

- Intuitive touch screen operation
- Compact size
- Easy loading
- Easy spring pin access for jam clearing/maintenance
- Powered ejection conveyors improve safety and batch modes
- Improved cut mechanism to reduce shards
- Built in end of web to reduce reload time
- Standard 4 pack Cart w/ wind guard

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INTUITIVE TOUCH SCREEN OPERATION

- Foot pedal mode
- Batch mode
- EDS mode
- Preset mode
- Statistics
- Recipe mode
PRODUCT OFFERING COMPETITION

- Foil Bubble (aluminized)
- Other Insulating Liners (denim, jute, foam, cellulose)
- EPS Panels
- EPS Coolers

Check carefully what/who/which/how competition is offering
TEST REPORT
FRESH JUICES (1)

• Tested products
• Materials and equipment
• Conditioning parameters
• Thermo couple and PCM positioning
• Test procedure (ISTA 7A Summer profile)
TEST REPORT
FRESH JUICES (2)

• Geami wrapping

• WrapPak package
TEST REPORT FRESH JUICES (3)

- Temperature test results:
  14% lower in temperature

- Cost calculation:
  25% lower in costs
TEST FOR FROZEN DOG FOOD

• Frozen dog food
• Weight: 2-25 kg
• Target: 24 hours <0°C
• Summer: dry ice; winter: gel packs
• Eps panels with void fill paper
PACKING COMPARISON FOR CHOCOLATES

- ISTA summer profile
- WrapPak with foil bubble and eps panels
- 1 box premium godiva chocolate
  Conditioned at 5°C
- PCM: 2x gel packs (680 gr)
- Conditioned at -10°C
PACKAGING ASSEMBLY

- Produce the required pad length
- Add the pads to the box
- Add the groceries and gel packs
- Tape the box

- Separation of PCM?
- Plastic bag?
THE BIGGEST CHALLENGE: LABOUR

- Costs for handling, storage, freight
  - No. of trucks/space
  - Purchase orders
  - Size of packing area
  - Internal transfer of boxes
  - 1 Pallet vs 2.600 boxes?
STANDARD BOXES
WITH 1-2-3 LAYERS

3 Standard box sizes:

Small (9L) 1 meal
Medium (24L) 3 meals
Large (36L) 5 meals
# STANDARD BOXES

3 Quality levels

<table>
<thead>
<tr>
<th>Quality Level</th>
<th>Performance Level</th>
<th>Layer(s)</th>
<th>PCM’s</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>Low</td>
<td>Single</td>
<td>2</td>
</tr>
<tr>
<td>Medium</td>
<td>Medium</td>
<td>Double</td>
<td>4</td>
</tr>
<tr>
<td>High</td>
<td>High</td>
<td>Triple</td>
<td>6</td>
</tr>
</tbody>
</table>