Qualifying foreign corks for domestic sales

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Qualifying Foreign Corks for Domestic Sales

By James J. Gross
Background

• Saxco Intl., the leading supplier of glass and packaging to the beverage industry, became interested in pursuing opportunities to offer their customers a synthetic cork solution during the 3rd quarter of ‘09.

• Analysis of the current market situations quickly resulted in a conclusion that the domestic manufacturers and qualified/existing foreign manufactures were either:
  – Too expensive for resale
  – Selling directly
  – Partnered with another distributor
  – Did not meet Saxco’s quality standards
Saxco turned its efforts towards qualifying a new vendor that was not currently in the North American market and act as their sole representation domestically.

Various samples were requested, received and examined. Two manufacturers were selected as candidates based on:

- Price
- Perceived quality
- Product uniqueness
- Perceived customer service

Saxco determined, before offering these products to customers, three forms of testing would be required:

- FDA compliance – Is the closure safe for food contact?
- Mechanical – Will the synthetic cork perform on par with conventional closures?
- Organoleptic – Will the synthetic cork impart a taste/coloring to the product?
Introduction - Cork

- Cork is a natural substance that comes from the bark of the “cork tree”, *Quercus Suber*, also known as Cork Oak. These trees are found primarily in southwest Europe and Northwest Africa, with Portugal accounting for approximately 50%.
- Cork has been used as a closure for many years, dating back at least to the Greeks and Romans.
- Cork prices continue to rise as demand for the product is taxing the supply we can expect from the relatively concentrated population of cork trees. This has partially led to the invention of various other closure solutions, such as: crowns – beer & soda (*note the liner used to be made from cork, hence “Crown, Cork, & Seal Co.”), Stelvin/Stelcaps – wine & spirits, TE plastic caps, and more recently synthetic cork.
Cork - Positive Properties:

- Creates an effective barrier to gas and liquid.
- Is malleable enough to assume the shape of a bottle bore, given proper sizing. Often, this can help make up for small defects in the bottle bore.
- Can be re-applied after initial opening.
- Due to its popularity and history, it is associated with a high quality beverage.
- Allows very small amounts of oxygen to pass, which adds to the aging process of red wines. This unique property is partially why cork is used on high end wine instead of alternative closures.
Cork – Negative Properties

• Natural material; prone to natural defects and inconsistencies.
• Low quality material can crumble when opening.
• Can influence the flavor of the product it seals, ie *cork taint*. This is why we frequently see an alternative closure used for white wines and clear spirits such as vodka.
Alternative – Crowns & Plastic Caps

• Crowns
  – Generally one time use for single serve portions. Pry off & twist off orientations.
  – Excellent barrier properties, with new technologies such as Oxygen Scavenging materials.
  – Used primarily on beer.

• Plastic caps
  – Various finishes and styles available.
  – Low cost, but also cheap in appearance.
  – Can be dressed up with overcaps or processes such as metallization.
  – Lesser barrier properties.
  – Generally used on spirits/liquor.
Alternative Closures – Stelvin/Stelcap

• Stels
  – Made of metal with various liners
  – Appearance continues to improve, and association with higher end product is also growing.
  – Very strong barrier. Allows almost no oxygen to pass. Stels are not associated with aging.
  – Screw on/off design lacks quality feel.
Synthetic Cork

• Synthetic cork is made of a polymer that has either been extruded or injection molded.

• Synthetic Cork vs. Natural Cork:
  – Less expensive
  – Uses same application machinery
  – Mimics application “feel” customers expect from cork.
  – Generally malleable, though often not as much as natural cork.
  – Quality is more consistent.
  – Barrier characteristics are closer to cork than other alternatives.
  – No “cork taint” allows use with white wines and clear spirits.
  – Does not crumble.
  – Cannot mimic the natural “look” of cork.
Synthetic Cork - Concerns

• FDA compliance
  – Polymer contact with alcoholic beverage
  – Particle leeching
• Mechanical Testing
  – Adhesion to stopper (plastic/wood)
  – Leak testing
  – Polymer breakdown
• Organoleptic Testing
  – Presence of cork taint
Methods – FDA Compliance

• Saxco engaged Intertek to perform testing against FDA requirement 21 CFR 176.170.
• Testing was conducted for materials in contact with beverages containing 8% ethanol and above.
• Three samples from each vendor were exposed to 10% aqueous ethanol. Three more were exposed 50% aqueous ethanol.
• The mean extractives for each sample set were measured against the acceptable limit of 0.5 mg/inch².
Methods – mechanical testing

• Saxco enlisted the aid of a major customer, and secured their testing protocol for natural corks. Information on synthetic cork testing protocol is very limited.

• Saxco then turned to RIT’s Packaging Science program and utilized their packaging lab, instruments, and expertise to carry out 3 separate tests:
  – Foreign Material Weight Determination
  – Cork Bartop Bond Test
  – Leakage Test for Corked Packages
Foreign Material Weight Determination

- Materials: Distilled water, filter paper, corks samples, Shaker, beakers
- Filter paper is measured and weighed, dry.
- Distilled water is placed in a beaker. Corks are placed in the water. Beakers are placed in the shaker and allowed to shake for 24 hrs.
- Water is then paced through the filter paper.
- Filter paper is dried, weighed, and checked against original weight for any gain which would be attributed to foreign material.
Cork Bartop Bond Test

- Materials: cork samples, torque tester, heat chamber
- Cork samples are heated, and allowed to sit for 1 hour.
- Bartop is placed in torque tester grips and twisted to 8.5 lbs.
- Separation is noted. Pass/fail.
Leakage Test

- Materials: 10 bottles, 10 corks, Evan Williams Whiskey, Heat Chamber, white paper.
- Bottle samples were sent to the cork vendors for measurements. Ideal samples were then received.
- Bottles and samples were used by RIT.
  - Twelve 750 ml bottles were filled to 750ml.
  - Whiskey of at least 40 proof was used, as stated in protocol.
  - Five corks from each manufacture were applied.
  - Bottles were placed in heat chamber, on their side, at a constant temperature of 110 degrees Fahrenheit for 24 hours.
  - White paper was placed beneath the bottles to determine any leaks.
## Results - FDA Compliance

<table>
<thead>
<tr>
<th>Sample</th>
<th>Extractant</th>
<th>Results (mg/inch²)</th>
<th>Mean results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Company A</td>
<td>10% aqueous ethanol</td>
<td>0.5</td>
<td>0.4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.2</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.5</td>
<td></td>
</tr>
<tr>
<td>Company A</td>
<td>50% aqueous ethanol</td>
<td>0.3</td>
<td>0.3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.3</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.3</td>
<td></td>
</tr>
<tr>
<td>Company B</td>
<td>10% aqueous ethanol</td>
<td>0.4</td>
<td>0.4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.3</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.4</td>
<td></td>
</tr>
<tr>
<td>Company B</td>
<td>50% aqueous ethanol</td>
<td>0.4</td>
<td>0.3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.1</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>*</td>
<td></td>
</tr>
</tbody>
</table>
## Results – Foreign Material Weight Determination

<table>
<thead>
<tr>
<th></th>
<th>A4</th>
<th></th>
<th>B4</th>
<th></th>
<th>B2 Mini</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Before</td>
<td>After</td>
<td>% difference</td>
<td>Before</td>
<td>After</td>
<td>% difference</td>
</tr>
<tr>
<td>1</td>
<td>0.876</td>
<td>0.876</td>
<td>0.00%</td>
<td>0.86</td>
<td>0.857</td>
<td>-0.35%</td>
</tr>
<tr>
<td>2</td>
<td>0.866</td>
<td>0.867</td>
<td>0.12%</td>
<td>0.852</td>
<td>0.851</td>
<td>-0.12%</td>
</tr>
<tr>
<td>3</td>
<td>0.879</td>
<td>0.879</td>
<td>0.00%</td>
<td>0.85</td>
<td>0.846</td>
<td>-0.47%</td>
</tr>
<tr>
<td>4</td>
<td>0.846</td>
<td>0.847</td>
<td>0.12%</td>
<td>0.857</td>
<td>0.853</td>
<td>-0.47%</td>
</tr>
</tbody>
</table>

- A4 & B4 represent monobloc cork stoppers.
- B2 Mini represents shank sleeve material.
- No sediment was noted.
Results – Cork Bartop Test

<table>
<thead>
<tr>
<th>Sample</th>
<th>A1</th>
<th>A2</th>
<th>A3</th>
<th>B1</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>10.94</td>
<td>8.05</td>
<td>5.35</td>
<td>8.26</td>
</tr>
<tr>
<td>2</td>
<td>11.09</td>
<td>7.81</td>
<td>3.83</td>
<td>9.78</td>
</tr>
<tr>
<td>3</td>
<td>11.04</td>
<td>6.97</td>
<td>6.12</td>
<td>10.55</td>
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<tr>
<td>4</td>
<td>10.1</td>
<td>9.15</td>
<td>4.9</td>
<td>9.74</td>
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<tr>
<td>5</td>
<td>10.83</td>
<td>10.31</td>
<td>1.7</td>
<td>11.61</td>
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<tr>
<td>6</td>
<td>9.14</td>
<td>8.48</td>
<td>1.13</td>
<td>11.06</td>
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<tr>
<td>7</td>
<td>9.79</td>
<td>9.53</td>
<td>7.35</td>
<td>9.98</td>
</tr>
<tr>
<td>8</td>
<td>9.79</td>
<td>10.25</td>
<td>1.85</td>
<td>9.63</td>
</tr>
<tr>
<td>9</td>
<td>9.79</td>
<td>9.68</td>
<td>2.93</td>
<td>9.11</td>
</tr>
<tr>
<td>10</td>
<td>10.16</td>
<td>9.26</td>
<td>1.99</td>
<td>9.46</td>
</tr>
</tbody>
</table>

• This chart designates the lbs/sq. inch of torque at failure.
• Green = pass; Red = fail
• A1, A2, and B1 are plastic stoppers
• A3 is a wooden stopper
## Results – Cork Bartop Test

<p>| | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>mean</td>
<td>10.267</td>
<td>8.949</td>
<td>3.715</td>
<td>9.918</td>
</tr>
<tr>
<td>SD</td>
<td>0.669727</td>
<td>1.095237</td>
<td>2.131782</td>
<td>0.961224</td>
</tr>
</tbody>
</table>
## Leakage Test

<table>
<thead>
<tr>
<th>Trial 1</th>
<th>Trial 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>bottle</td>
<td>status</td>
</tr>
<tr>
<td>A1</td>
<td>Failed</td>
</tr>
<tr>
<td>A2</td>
<td>Failed</td>
</tr>
<tr>
<td>A3</td>
<td>Failed</td>
</tr>
<tr>
<td>A4</td>
<td>Failed</td>
</tr>
<tr>
<td>A5</td>
<td>Failed</td>
</tr>
</tbody>
</table>
Discussion

• In light of the results Saxco made several determinations:
  – The inability of the potential vendors, as well as several control corks, to pass the leak test has Saxco searching for a new standard. Saxco has approached the largest user of synthetic corks in the industry in hopes of using their testing standards.
  – Saxco will not move forward with Organoleptic testing until they are satisfied that the corks will properly seal a bottle.
• The wooden bartops continue to be a problem.
  – The industry, specifically Marketing, demands upscale options
  – Manufacturers are still working to find the proper glue to bond the synthetic material yet remain safe for food contact.
Acknowledgments

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    • Dr. Changfeng Ge
    • Staff

• Saxco International