RISI North American Outlook
North American Corrugated Box and Containerboard

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Vice President, Global Packaging
A Renaissance for the North American Containerboard and Boxboard Markets

• Domestic demand growing solidly
  ▪ Ongoing recovery in manufacturing
  ▪ Boosted by new opportunities for growth

• Trade balance is shifting dramatically in both markets
  ▪ Policy shifts in China leading to major changes
  ▪ What’s happening in other parts of the world?

• When will capacity expansion surpass demand growth?
Industrial Production of Processed Foods and Other Nondurable Goods Has Rallied Since 2016

Annual Growth, Percent
US Corrugated Box Shipments and Containerboard Cutup Has Outpaced Manufacturing Since 2014

- E-commerce is boosting the impact of the rally in manufacturing
How Large Is the Boost from E-commerce?

Hard data are difficult to find, leading to subjective estimates

- Discernable upturn in ratio of shipments to nondurable goods production since 2014
- What would 2017 shipments have been if this ratio remained at 2004-2013 level?
How Large Is the Boost from E-commerce?

Box shipments would have increased 2.5% from 2014 low in 2017 just from growth in nondurable goods production

- Actual shipments were up 5.9% instead
- E-commerce estimated to have added 20-23 billion square feet of corrugated box demand in four years
- Not counting any growth in non-box uses of corrugated sheet
Non-box Uses of Sheets Is Growing Rapidly

Corrugator production has grown well in excess of box shipments
The Growth in E-commerce Is Changing Seasonal Patterns for Box Shipments

Quarter to Quarter Growth, Billion Square Feet, Raw Data

Quarter to Quarter Growth, Billion Square Feet, Seasonally Adjusted

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Downside from E-commerce: Product Design Will Eventually Shift

From the Amazon Frustration-Free Packaging webpage:

- Overpackaging will begin to abate, leading to a more moderate boost to corrugated demand
- Boxboard demand could be undercut if packaging gets an e-commerce redesign
What Does This Mean for Domestic Demand?

- Continued growth in shipments as long as the economy is hot
- Cutup and corrugated sheet production should continue to outpace box shipments
International Trade Issues

- China’s policy shifts regarding recovered paper imports are having global implications
The Impact of China’s RCP Import Policy Changes

RCP Imports, Thousand Tonnes

China RCP Imports

<table>
<thead>
<tr>
<th>Year</th>
<th>Mixed</th>
<th>Other RCP</th>
</tr>
</thead>
<tbody>
<tr>
<td>2017</td>
<td></td>
<td>20,000</td>
</tr>
<tr>
<td>2018</td>
<td>25,000</td>
<td></td>
</tr>
</tbody>
</table>

RCP Fiber Loss

<table>
<thead>
<tr>
<th>Loss Type</th>
<th>2017</th>
<th>2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pulping Loss</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Virgin Pulp</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Finished P&amp;B</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Domestic Collections</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RCP Loss</td>
<td>11,600</td>
<td></td>
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<tr>
<td>0.5% Standard</td>
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Chinese Firms Are Investing in North American Assets as a Hedge Against a Potential 2020/2021 Zero RCP Import Policy

<table>
<thead>
<tr>
<th>Company</th>
<th>Mill</th>
<th>Grade</th>
<th>Type</th>
<th>Announced</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nine Dragons</td>
<td>Rumford, ME</td>
<td>Graphic paper</td>
<td>Pulp/Conversion?</td>
<td>May 2018</td>
</tr>
<tr>
<td>Nine Dragons</td>
<td>Biron, WI</td>
<td>Graphic paper</td>
<td>Conversion/Pulp</td>
<td>May 2018</td>
</tr>
<tr>
<td>Nine Dragons</td>
<td>Fairmont, WV</td>
<td>Deinked pulp</td>
<td>OCC/mixed pulp</td>
<td>September 2018</td>
</tr>
<tr>
<td>Nine Dragons</td>
<td>Old Town, ME</td>
<td>Kraft pulp restart</td>
<td>Unbleached pulp</td>
<td>October 2018</td>
</tr>
<tr>
<td>Global Win</td>
<td>Wickliffe, KY</td>
<td>Graphic paper restart</td>
<td>Conversion</td>
<td>August 2018</td>
</tr>
<tr>
<td>Sun Paper</td>
<td>Arkadelphia, AR</td>
<td>Pulp/Kraftliner</td>
<td>Greenfield</td>
<td>April 2016 / January 2018</td>
</tr>
<tr>
<td>More to come?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Assumed new capacity: 1.5 million tons
China’s Trade Position Is Shifting Dramatically

Boxboard was the first to be affected

- Exports peaked at 1.5 million tonnes in 2016
- Before dropping 134,000 tonnes in 2017
- Larger declines likely for 2018-2020
China’s Trade Position Is Shifting Dramatically

Changes in the containerboard market will dwarf the shift for boxboard

- Loss of imported OCC will have devastating impact on Chinese production
- Global containerboard imports totaled just 18.6 million tonnes in 2016
- 30% increase in global import demand
What Regions Will Supply the Shift in Chinese Imports?

Every one will be needed

Net Exports, Traditional Exporters
Million Tonnes

Challenge: Very limited slack (capacity less production) in any exporting region

North America Western Europe Russia & CIS Japan
South Korea Taiwan Thailand Brazil
South Africa Oceania

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What’s Happening in Other Parts of the World?

Imports continue to supply substantial portion of demand growth

Regional Net Imports, Million Tonnes

- Other Latin America
- Other Africa
- Middle East
- Other Emerging Europe
- Other Far East

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What Does This Mean for the North American Packaging Markets?

Strong increase in US containerboard exports

![Graph showing US Kraftliner Exports by Destination, YTD through July 2018](graph1.png)

![Graph showing US Containerboard Exports, Million Tons](graph2.png)

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Capacity Expansions
Seven Large Containerboard Expansions Were Listed in the May 2018 AF&PA Capacity Report

| Company         | Mill              | Grade                          | Change (000 Tons) | Year |
|-----------------|-------------------|动列                       |                  |      |
| PCA             | Wallula, WA       | Kraftliner conversion         | 400              | 2018 |
| Verso           | Jay, ME           | Kraftliner conversion         | 200              | 2018 |
| IP              | Selma, AL         | Kraftliner conversion         | 450              | 2019 |
| WestRock        | Florence, AL      | Replacement kraftliner machine| 27 net           | 2020 |
| Midwest Paper   | Combined Locks, WI| Recycled conversion           | 220 est.         | 2018 |
| Pratt           | Wapakoneta, OH    | New recycled mill             | 400              | 2019 |
| Green Bay       | Green Bay, WI     | Replacement recycled mill     | 445 net          | 2020 |

**Announced new capacity:** 2.1 million tons

**Unlisted incremental projects 2017-2018:** 856,000 tons
The List of Planned Containerboard Expansions Extends Beyond the AF&PA List

<table>
<thead>
<tr>
<th>Company</th>
<th>Mill</th>
<th>Grade</th>
<th>Change (000 Tons)</th>
<th>Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Announced Mills</td>
<td></td>
<td></td>
<td>1.14 million</td>
<td></td>
</tr>
<tr>
<td>Cascades</td>
<td>Ashland, VA</td>
<td>Recycled conversion</td>
<td>400</td>
<td>2021</td>
</tr>
<tr>
<td>McKinley/Bio-Pappel</td>
<td>Port Angeles, WA</td>
<td>Recycled conversion</td>
<td>250</td>
<td>Sept. 2019</td>
</tr>
<tr>
<td>New Indy</td>
<td>Catawba, SC</td>
<td>Kraft/recycled conversion</td>
<td>400</td>
<td>2020?</td>
</tr>
<tr>
<td>Norpac</td>
<td>Longview, WA</td>
<td>Recycled conversion</td>
<td>90</td>
<td>2018</td>
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<tr>
<td>Traditional Creep</td>
<td>Assumed</td>
<td>All</td>
<td>450</td>
<td>Annual</td>
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<tr>
<td>Under study:</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Domtar</td>
<td></td>
<td>Will they or won’t they?</td>
<td>???</td>
<td>2021 or beyond?</td>
</tr>
<tr>
<td>Other conversions</td>
<td></td>
<td></td>
<td>???</td>
<td></td>
</tr>
</tbody>
</table>

Additional assumed capacity: 240,000 tons 2018-2020, 1.5 million tons 2021-2023
Bottom Line: The Demand/Supply Balance Is Not Expected to Loosen Before 2020

Surge in exports to China offsets weakness in domestic demand
North American Containerboard Summary

• Domestic demand will continue to grow strongly through 2020
  ▪ Barring an earlier-than-expected economic slowdown

• Trade shifts should boost production through 2020
  ▪ Policy shifts in China leading to major changes

• Operating rates should remain well above historical norm
  ▪ Even with the large amount of planned containerboard capacity that is scheduled to come on line
For more information on RISI’s global paper packaging and containerboard coverage, visit www.risi.com.