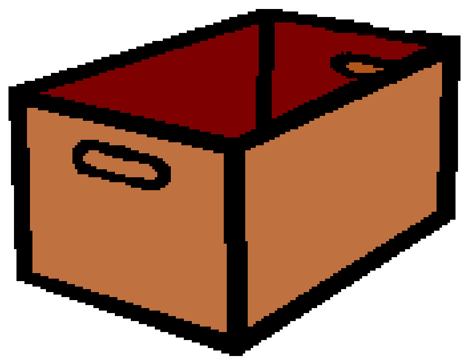
Paper: Old Corrugated Containers

COMMODITY PROFILE

North Carolina Department of Environment and Natural Resources
DIVISION OF POLLUTION PREVENTION AND ENVIRONMENTAL ASSISTANCE

MARKETS ASSESSMEN 1998



OVERVIEW

Almost five of every 10 corrugated containers are now being recovered in North Carolina, which is below the national average of 67 percent. In 1997, more than 400,000 tons of old corrugated containers (OCC) were recovered in North Carolina, with private sector recovery accounting for about 85 percent of this tonnage.

Most recovered OCC is recycled back into new containerboard (single- and multi-ply, solid and corrugated boards used to make boxes and other containers for shipping materials) at United States mills. Recycled paperboard manufacturers are the second largest domestic consumers of OCC.[1]

Demand for OCC is not likely to increase beyond minimal annual growth until it has been shown that OCC recovery can increase significantly over current levels. Without assurances that the necessary supply of OCC will be available as feedstock, paper recycling companies will continue to be hesitant to commit to building new OCC-consuming mills.

SUPPLY

Generation

In 1997, North Carolina generated 852,770 tons of OCC, up from an estimated 734,000 tons in 1994.[2] Per capita generation of OCC nationally was calculated using EPA data, and this factor was used to estimate generation in North Carolina for 1997 and 2002.[3] In 2002, North Carolina generation is expected to grow to 904,894 tons.

The supply of OCC in the Southeast region also has grown.[4] In 1997, more than 6.5 million tons of OCC were generated in the region. This tonnage was estimated by applying the national per capita generation rate to each state. In 2002, generation in the region is anticipated to grow to slightly more than seven million tons.[5]

Figure 1: Estimated Generation and Recovery for OCC in North Carolina

	1997	2002
Generation	852,770	904,894
Recovery	424,456	606,279

Figure 2: Estimated Generation and Recovery for OCC in Southeast Region

	1997	2002
Generation	6,674,133	7,059,511
Recovery	4,471,669	4,729,872

Figure 3: Recovery of Containerboard in the United States

Supply Segment	Current Recovery (%)	Projected Maximum (%)
Pre-consumer	90	95
Manufacturing	70	75
Large retail / commercial	81	83
Small retail / commercial	70	77
Residential	5	25

Recovery

In 1997, more than 400,000 tons of OCC were recovered in North Carolina, yielding a recovery rate of almost 50 percent. The projection for recovery in 2002 ¾ 606,279 tons ¾ assumes that North Carolina's recovery rate for OCC has reached the national average of 67 percent, which may overestimate actual recovery.[6] Recovery was calculated using public and private sector recycling data. Public sector data were derived from responses to the *Annual Solid Waste Management Reports* submitted by local governments, and private sector data came from a recycling survey conducted by DPPEA in the spring of 1998.

Recovery in the Southeast region was calculated by applying the national recovery rate to the generation numbers for the region. In 1997, almost 4.5 million tons of OCC were recovered in the region, and 4,729,872 tons will likely be recovered in 2002. Again, this calculation may overestimate actual recovery. Figures 1 and 2 compare generation and recovery for North Carolina and the Southeast region.

Recovery of OCC occurs primarily in the private sector in North Carolina. Private sector recovery accounted for 86 percent of total OCC recovery, or 424,456 tons, and only about 14 percent was collected through local government recycling programs.[7] More than 30 local governments have enacted disposal diversion ordinances (DDOs) that ban or restrict cardboard from disposal in landfills, which has helped to boost private sector recovery. For a complete listing of North Carolina local governments with DDOs, contact the North Carolina Division of Pollution Prevention and Environmental Assistance (DPPEA) at (919) 715-6500.

Further gains in OCC recovery may be impeded by the misperception that OCC recovery is at or near its peak, and that any incremental growth in recovery will cost more than disposal. This misperception is based to a certain extent on industry claims that 73 percent of OCC was recovered nationally in 1997. However, this percentage includes pre-consumer scrap (e.g., converting and fabricating scrap), which is not counted towards post-consumer recovery by EPA.

Understanding the characteristics of the supply stream helps determine the best ways to stimulate recovery and demand. The post-recovery supply stream of OCC can be divided into four segments: commercial / retail, manufacturing, residential, and pre-consumer. Commercial / retail OCC makes up a majority at slightly more than 50 percent of total containerboard supply in the United States, followed by OCC from the manufacturing sector at 28 percent. Residential OCC makes up 13 percent of total supply, and pre-consumer OCC comes in last at eight percent.[8]

A national analysis of OCC recovery trends outlines how each segment of containerboard supply impacts recovery and identifies opportunities to increase recovery.[9] (See Figure 3.) Since North Carolina's recovery rate is below the national average, there maybe more opportunities to increase recovery in the state than nationally. Pre-consumer containerboard discards have historically been recovered at very high rates, about 90 percent, and an increase to about 95 percent could be reasonably expected in this segment.

In contrast, recovery rates of post-consumer containerboard discards have varied widely. Recovery from the manufacturing segment has been relatively high, about 70 percent, and can be expected to increase marginally to about 75 percent, which represents the estimated maximum available fraction of material not contaminated or damaged. At large commercial / retail establishments (e.g., regional shopping malls) recovery rates have risen close to the possible maximum, which is estimated at 83 percent. However, the recovery from small establishments (e.g., strip malls or stand-alone fast food restaurants) has been far lower, around 53 percent until the past several years because of difficulty in retrieving the material from numerous small generators. A maximum of 77 percent recovery is assumed for this segment, but it will not be achieved in the near future.

The analysis shows that many of the recovery rates from the readily available supply segments have been pushed near their maximum achievable levels nationally. The small commercial / retail segment offers the greatest potential gains in recovery. Recovery of OCC from residences is quite low, about five percent; and even at its projected maximum of 25 percent, it is not expected to become a significant factor in overall recovery. North Carolina may have greater opportunity to work with the segments that are near maximum recovery nationally, as this state has not reached the national recovery rate for OCC.

Why aren't small businesses capturing OCC? These generators tend not to realize the same economic benefits as larger generators, because the fixed cost of implementing a system is not offset as quickly because of lower tonnage. Thus, there is a much higher cost/revenue ratio for collecting OCC from small businesses. In addition, some small businesses cannot benefit from reduced solid waste disposal fees as a result of OCC recovery, because these fees are incorporated into rent or lease payments. Without the incentive of reduced disposal costs, few small businesses are willing to support OCC recycling.

Another problem for small businesses may be lack of storage space. Collection of OCC typically requires a storage bin of at least one cubic yard, and more realistically a three-cubic-yard dumpster. However, many small businesses lack the space to keep an extra dumpster behind their establishment, and storing OCC inside in a smaller bin requires additional labor.

Small businesses are not the only entities facing limits to recovering more OCC. A barrier to recovery by all segments of the supply stream is wax contamination. Approximately 1.25 million tons of waxed OCC are now discarded annually in the United States. The presence of wax causes several problems for end users, including reduced surface-to-surface friction and strength. Soon, however, this barrier may be overcome. In an industry-sponsored research project, 97 percent of the paraffin wax was removed from wax-saturated boxes in an OCC medium-consistency pulping and screening system.[10] Several commercial-scale systems using this patented process may start-up in the next year, and at least one major paper producer has indicated plans to install the process at one of their United States mills within a year. Another option involves modifying the wax with dispersants and requires a hot dispersion step to be added in processing, enabling the wax to disperse.[11]

DEMAND

The primary market for OCC is the paperboard industry, which uses OCC for corrugating medium, linerboard, recycled paperboard, and other paper products. A majority (63.5 percent) of total recovered OCC in the United States is used to make new containerboard. Recycled paperboard represents the second largest share of total consumption at 17.4 percent. Exports represent 12.1 percent of the total, tissue consumes 1.1 percent, and all other uses combined represent 5.9 percent.[12] Fiugres 4 and 5 present estimated demand for OCC by end use in 1997 and 2002.[13]

In its latest capacity survey, AF&PA projected that recovered paper consumed between 1997 and 1999 would rise by approximately three million tons, reaching 37.7 million tons in 1999. OCC alone will comprise about half of total consumption and along with old newsprint will make up slightly more than 70 percent.[14] In addition, OCC is projected to account for 70 percent of the incremental recovered paper consumed during this period.

This capacity survey also projected that United States paper and paperboard manufacturing capacity will expand an average 1.2 percent annually from 1998 through 2000, or less than one-half the average 2.5 percent annual rate of the previous decade. Increased reliance on recovered paper is expected to repress wood pulp capacity expansion to an average annual growth rate of only 0.4 percent during the next three years, compared to 1.3 percent annually during the past 10 years.

Figure 4: Estimated Demand for OCC in North Carolina (in thousands of tons)

End Use	1997	2002
Containerboard	512.8	523.6
Recycled paperboard	140.5	143.5
Net exports	97.7	99.8
Tissue	8.9	9.1
Other	47.7	48.7
Total	807.6	824.7

Figure 5: Estimated Demand for OCC in Southeast Region (in thousands of tons)

End Use	1997	2002
Containerboard	4,013.5	4,097.8
Recycled paperboard	1,099.8	1,122.9
Net exports	764.8	780.9
Tissue	69.5	71.0
Other	372.9	380.7
Total	6,320.5	6,453.3

Total recovered paper consumption is projected to grow 2.1 percent annually through the year 2000; however, this projection does not reflect aggressive capacity growth outside the United States. In comparison, recovered paper consumption rose 8.1 percent in 1996 and 7.2 percent in 1997. Similarly, consumption of recovered corrugated is projected to rise by 2.1 percent as well.[15] This is considerably lower than the 7.5 percent rate for 1997, because nine new containerboard projects started up in the past two years, while just two are slated to come on line during the 1998-99 period.

Linerboard capacity has influenced OCC demand more in this decade than in the past. Most of the linerboard capacity added since 1993 has been for recycled content linerboard. In 1994, recycled capacity was only about 1.6 million tons per year, or about eight percent of total linerboard production capacity. Currently it is about 4.7 million tons, or about 18 percent of the total.[16] This means that when OCC prices drop and recycled linerboard mills become more cost-competitive, their impact on the industry's overall operating rate is significant, given their share of capacity. More recycled linerboard capacity is expected to come online this year as well. Likely reasons for the increase in capacity include the following:

- shorter construction time and lower capital costs for recycled capacity
- expectations of more materials available for recovery and inadequate capacity to utilize them
- desire of independent corrugated containerboard producers to minimize their vulnerability to linerboard price fluctuations
- availability of tax-exempt bonds to finance construction of recycled linerboard machines

Recent fluctuations in foreign demand have been another key variable affecting OCC markets. The five largest foreign importers of United States' OCC are Canada, Korea, Mexico, China, and Japan.[17] According to the AF&PA, total OCC exports achieved a record high of 4.3 million tons in 1995.[18] However, the level of OCC exports dropped to 2.8 million tons in 1996 and 2.6 million tons in 1997, due to the following factors: decreased foreign purchases, increased recovery efforts abroad, increased supplies of recovered paper from Europe, and the devaluation of foreign currencies.[19]

Following a strong period of industry expansion over the past decade, domestic paper producers now expect slow growth for the remainder of the 1990s. The projected rise in recovered paper consumption during the next three years, while continuing to increase faster than wood pulp use, will be far below the earlier pace.

End Users in North Carolina and Surrounding States

The following end users in North Carolina use OCC as feedstock: [20]

- Carolina Paper Board Corp., Charlotte, North Carolina: Products: 100 percent recycled rigid and folding boxboard and chipboard. Total paperboard capacity: 50,730 metric tons per year. Feedstock: OCC, double-lined kraft (DLK), ONP, mixed paper, and pulp substitutes. Carolina Paper Board used about 16,000 tons of OCC from North Carolina last year.
- Halifax Paperboard Co., Inc., Roanoke Rapids, North Carolina: Products: rigid and folding boxboard, chipboard, pasted board, and mounting and laminated board. Production capacity: 105 tons daily. Total paperboard capacity: 34,360 metric tons per year. Feedstock: OCC, DLK, ONP, mixed paper and pulp substitutes.
- Jackson Paper Manufacturing Co., Sylva, North Carolina: Products: 100 percent recycled corrugating medium. Production capacity: 240 tons daily. Total paperboard capacity: 85,100 metric tons per year. Feedstock: OCC.
- U.S. Packaging, Inc., Maxton, North Carolina: Products: cellulose wadding for packing and cushioning. Production capacity: 12 tons daily. Total capacity: 4,000 metric tons per year. Feedstock: OCC and coated book.
- Weyerhaeuser Paper Co., Plymouth, North Carolina: Products: corrugating medium, kraft linerboard and various fine papers. Production capacity: 1,100 tons daily for containerboard, 1,000 tons daily for fine papers. Total paperboard capacity: 785,400 metric tons per year, with 425,000 metric tons per year for linerboard and 360,000 metric tons per year for corrugating medium. Feedstock: OCC. Current expansion includes two continuous digesters, two oxygen delignification systems and a new bleach plant at a cost of $500 million.

The following end users in surrounding states also use OCC as feedstock:[21]

Containerboard Mills

- Georgia-Pacific Corp., Big Island, Virginia
- Interstate Resources Inc., Riceboro, Georgia
- Temple-Inland Inc., New Johnsonville, Tennessee
- Riverwood Intl., Macon, Georgia
- St. Laurent Paperboard, West Point, Virginia
- Somerset Fiber Co., Cowpens, South Carolina
- Stone Container Corp., Florence, South Carolina; and Port Wentworth, Georgia
- Tenneco Packaging, Counce, Tennessee
- Union Camp Corp., Savannah, Georgia
- Virginia Fibre Corp., Amherst, Virginia
- Visy Paper Inc., Conyers, Georgia
- Westvaco Corp., Covington, Virginia

Paper/Board Mills

- Caraustar Industries, Inc., Austell, Georgia; Chattanooga, Tennessee; and Taylors, South Carolina
- Jefferson Smurfit Corp., Cedartown, Georgia
- Richmond Paperboard Corp., Richmond, Virginia
- Rock-Tenn Co., Chattanooga, Tennessee; and Lynchburg, Virginia
- Sonoco Products Co., Atlanta, Georgia; Hartsville, South Carolina; Newport, Tennessee; and Richmond, Virginia

Tissue Mills

- Fort James Paper Co., Rincon, Georgia
- Power Paper Co., Harriman, Tennessee

SUPPLY / DEMAND RELATIONSHIP

As illustrated in Figures 6 and 7, demand exceeds supply of OCC for both North Carolina and the Southeast region. This imbalance is evident in 1997 and is projected to continue into 2002. Several end users have indicated that they

Figure 6. Estimated Supply and Demand for OCC in North Carolina

	1997	2002
Supply	424,456	606,279
Demand	747,200	761,399

Figure 7. Estimated Supply and Demand for OCC in Southeast Region

	1997	2002
Supply	4,471,669	4,729,872
Demand	6,207,500	6,325,442

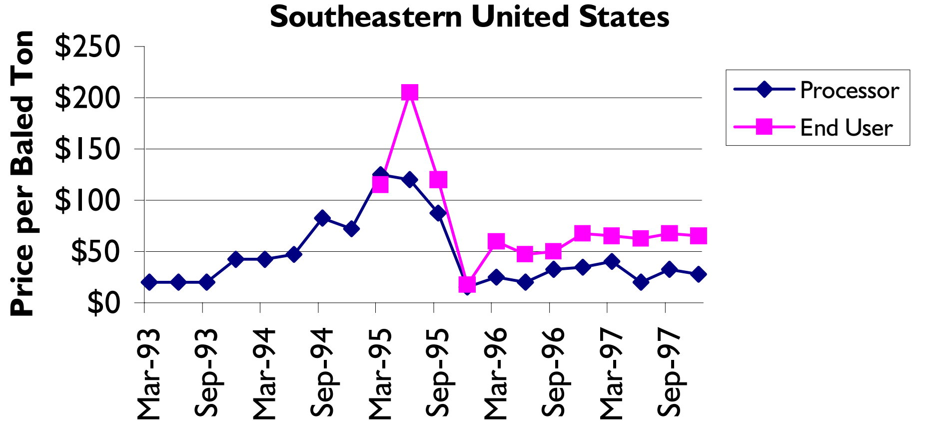


Figure 8. OCC Price History, Southeastern United States

would welcome additional supply of OCC; however, others are decreasing their reliance on OCC by switching to other recycled fiber sources as a result of contamination problems.[22]

Demand for OCC is not likely to increase beyond minimal annual growth until it has been shown that OCC recovery can increase significantly over current levels. Without assurances that the necessary supply of OCC will be available as feedstock and free of contamination, paper-recycling companies will continue to be hesitant to commit to building new OCC-consuming mills.

Price History

The market for OCC was more variable in 1997 than for many other grades of recovered fiber. (See Figure 8.[23]) Prices for containerboard are extremely sensitive to changes in the economy, because shifts in gross national product growth directly affect consumer spending, which in turn results in the packaging of finished consumer goods.[24]

Growth in containerboard capacity and increased operating rates led to OCC prices rising in 1994. This was due not only to a rise in output, but to low inventories at mills and paper processing plants, a sudden pickup in both domestic and export demand, and a strong economy for the United States. Prices continued to climb through 1994 and early 1995, with a brief downturn in early fall 1994. However, OCC prices turned down again in the second half of 1995. In 1996, OCC prices rebounded briefly in the first quarter and turned down again, but began to gradually strengthen in spring and summer. At the end of 1997, OCC prices were averaging $28 per ton for processors and $65 per ton for end users.

Industry experts believe that OCC prices will remain depressed until linerboard prices increase, as excess linerboard capacity is dampening containerboard prices. However, when the price does increase, it is likely to be significant and occur quickly.[25]

CONCLUSION

The numbers tell the story. There is still room for growth in OCC recovery, as demand is currently outpacing recovery, and this imbalance is projected to continue in the near term. As mentioned earlier, a primary barrier to increasing OCC recovery is the misperception that OCC recovery is at or near its peak, and that any incremental growth in recovery will cost more than disposal.

Small retail / commercial and residential sectors are two segments of containerboard supply that are far from reaching maximum achievable recovery levels, meaning they present an opportunity for increasing OCC supply. Boosting OCC recovery from the small retail sector would require several concerted steps. First, the types of small businesses generating the majority of unrecovered OCC must be identified, and then strategies to target those businesses must be developed (assuming these businesses fall into several clear categories).

RECOMMENDATIONS

- The State of North Carolina should educate local government recycling coordinators that there is still considerable OCC to be recovered.
- To boost OCC recovery in the small retail sector, the state should develop tools targeting small businesses likely to generate OCC and promote these tools at appropriate business meetings. One way to encourage OCC recovery in the small retail sector would be to apply the concept of "cooperative marketing" to OCC collection. It is likely that some small businesses are already participating in cooperative OCC collection, especially in

business parks or shopping centers, and such efforts could be documented and promoted to other small businesses. Assistance in overcoming the barrier of limited storage space could be provided by identifying businesses that have creatively overcome their space limitations and highlighting their approaches. Similarly, examples of small businesses influencing building managers to pass on disposal cost savings or examples of revised lease or rent agreements (to exclude solid waste disposal costs) could de provided.

- Given the supply/demand relationship in North Carolina, the state should investigate the implementation a statewide landfill ban on old corrugated containers. A statewide ban on OCC would be a more effective way to target a disparate group of unrelated businesses and residences. More than 30 North Carolina communities already have implemented local OCC bans or restrictions, and three states have bans on recyclable paper including OCC (Massachusetts, South Dakota, and Wyoming).[26] A key factor in a successful ban is adequate recycling infrastructure for the targeted material. As this report outlines, the recycling infrastructure in North Carolina and the Southeast region can handle additional OCC.
- To increase the amount of OCC recovered from the small retail / commercial sector in the absence of a ban, the state should encourage local government recycling programs to develop commercial mixed paper routes. These programs could collect largely OCC and office grades along with other grades of recovered paper, enabling OCC to be captured more economically. Both containerboard and recycled paperboard mills could use this grade of "board mixed."[27]
- Similarly, OCC should be collected with mixed paper from residences. An OCC rich (and ONP lean) RMP mix would also be attractive to some end users.
- Demand for post-consumer recovered paper, like demand for virgin pulp, is dependent on the production strength of the industries that consume the feedstock. As the economies of the United States and its foreign trading partners improve, demand for packaging materials such as containerboard will improve, and paper producers will increase their demand for OCC. Until then, the state should continue to educate the recycling community about the relationship between economic productivity and demand for secondary materials.

[1] Containerboard includes corrugating medium and linerboard (kraft paperboard used to line / face corrugated core board or to form shipping boxes and other containers).
[2] Office of Waste Reduction, NC DENR. *Assessment of the Recycling Industry and Recycling Materials in NC: 1995 Update*. November 1995.
[3] U.S. EPA. *Characterization of Municipal Solid Waste in the U.S.: 1997 Update*. May 1998. This 2002 projection assumes no change in the per capita generation rate.
[4] The following states are included in the southeast region: AL, FL, GA, KY, MS, NC, SC, TN, VA, and WV.
[5] This projection assumes no change in the per capita generation rate.
[6] National recovery rates may be higher than 67 percent in 2002; however, for NC to surpass the current national recovery level would require a percentage increase that seems unlikely in this time frame.
[7] DPPEA, recycling survey, spring 1998.
[8] Iannazzi, Fred and Clark, Rosemary. "When will OCC prices improve?" *Resource Recycling*. Vol. XVII, No. 1. January 1998. The discussion that follows is based on this article.
[9] Ibid.
[10] Powell, Jerry. "Critical issues in paper recovery." *Resource Recycling*. Vol. XVII, No. 6. June 1998.
[11] Doshi, Mahendra, et.al. "Semiannual Conference Review." *Progress in Paper Recycling*. August 1995.
[12] AF&PA, Inc. *Recovered Paper Statistical Highlights*, 1997.
[13] Demand total for the SE region is actual demand reported by AF&PA (AF&PA, Inc. *1998 Annual Statistical Summary: Recovered Paper Utilization*, 12th ed., June 1998). Percentages for specific end uses were applied to this total. Demand for North Carolina is interpolated using regional AF&PA data. Projections for 2002 assume a growth rate of 2.1 percent, which is the average growth rate for OCC projected by AF&PA for the next two years. If this growth rate increases, the projections here will underestimate demand.
[14] Miller Freeman, Inc. *Pulp & Paper 1998 North American Factbook*. 1997. p. 400.
[15] Miller Freeman, Inc. "Paper industry's use of recovered paper to slow considerably." *Paper Recycler*. Vol. 8, No. 12. December 1997.
[16] Iannazzi. *Resource Recycling*. Vol. XVII, No. 1. January 1998.
[17] AF&PA. *1998 Annual Statistical Summary, Recovered Paper Utilization.* 12th Edition. June 1998. p. 51, 57.
[18] Ibid. p. 47.
[19] Ibid.

[20] AF&PA. *PaperMatcher*, 4th ed. Miller Freeman, Inc. *1997 Lockwood-Post's Directory of the Pulp, Paper and Allied Trades*, Miller Freeman, Inc. *1998 International Pulp & Paper Directory*, manufacturer surveys.
[21] Ibid.
[22] Manufacturer surveys.
[23] Prices are from Waste Age's *Recycling Times*. Processor prices not available prior to 1995.
[24] Miller Freeman, Inc. *Pulp & Paper 1998 North American Factbook*. 1997. p. 19.
[25] Ibid.
[26] Jim Glenn. "The State of Garbage in America." *BioCycle*. Vol. 39, No. 5. May 1998.
[27] Personal communication, Bill Moore, Moore & Associates, September 1998.