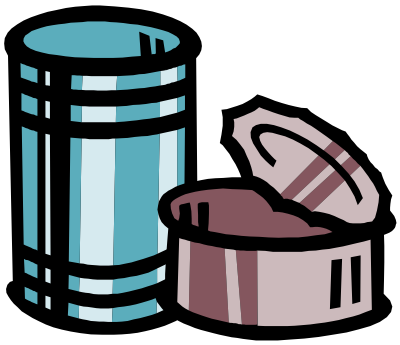
Metals: Steel Cans & Scrap

COMMODITY PROFILE

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

MARKETS ASSESSMENT 1998



OVERVIEW

This section focuses on steel cans, including aerosol, paint, food, and beverage cans. An overview of the national recovery of all other steel scrap also is included.

Because of the significant cost savings of recycling steel and other ferrous metals, these materials have a long history of being recycled. Steel mills melt scrap in basic-oxygen furnaces (BOFs) and electric arc furnaces (EAFs) and, to a minor extent, in foundries. The portion of steel scrap in the charge in a BOF is limited to less than 30 percent, whereas the charge in the EAF can be as much as 100 percent scrap. In 1996, BOFs produced 57 percent of total steel in the United States, while using only 22 percent of total scrap consumed. During the same period, EAFs produced 43 percent of total steel, while using 64 percent of total scrap consumed.[1]

In the United States alone, nearly 70 million tons of steel was recycled in steel mills and foundries in 1997. Recycled steel consists of approximately 30 percent home scrap (new recirculating scrap from current operations), 24 percent prompt scrap (produced in steel-product manufacturing plants), and 46 percent obsolete (old) scrap.[2]

The estimated national supply of steel cans was 2.8 million tons (21 pounds per person) in 1997. The national steel can recycling rate topped 60.7 percent, with more than 1.7 million tons of steel packaging recycled.[3] In North Carolina, out of an estimated total supply of 77,858 tons of steel cans, approximately 8,383 tons were recovered by the public and private sectors. This represents an 11 percent overall recovery rate for steel cans in 1997.

In 1997, the per capita generation of steel cans was 21 pounds. Strong demand allowed the industry to easily absorb the supply as more and more scrap was consumed in domestic steel production. The average price of steel can scrap in 1997 was $62.13 per ton.

Figure 1: Supply of Steel Cans

Year	Tons of Steel Cans Shipped[1]	Pounds	United States Population[2]	Pounds Per Person
1993	2,787,600	5,575,200,000	257,752,702	21.63
1994	2,929,500	5,859,000,000	260,292,437	22.51
1995	2,692,400	5,384,800,000	262,760,639	20.49
1996	2,818,100	5,636,200,000	265,179,411	21.25
1997	2,848,700	5,697,400,000	267,636,061	21.29
Average	2,815,260	5,630,520,000	262,724,250	21.43

Sources: 1) The Steel Recycling Institute
2) U.S. Census Bureau

Figure 2. Estimated Generation and Recovery of Steel Cans in North Carolina

	1997	1998	1999	2000	2001	2002
Generation (tons)[1]	77,858	78,971	80,004	80,961	81,787	82,617
Recovery (tons)[2]	8,383	8,503	8,614	8,717	8,806	8,895
North Carolina Population[3]	7,436,690	7,542,996	7,641,684	7,733,097	7,811,951	7,891,238

Sources: 1) Extrapolated from Steel Recycling Institute's National Supply Estimates
2) North Carolina Recycling Survey
3) North Carolina Office of State Planning

SUPPLY

The domestic supply rates for steel cans from 1993 through 1997 are presented in Figure 1. The per capita steel can supply rate has remained constant in recent years, and according to the Steel Recycling Institute, is expected to remain relatively constant in the near future.[4]

The generation and recovery estimates for steel cans in North Carolina are presented in Figure 2. The 1997 generation figure takes into account the national supply, adjusted for North Carolina's percentage of the United States' population (2.78 percent). The projections for generation of steel cans for 1997 through 2002 were estimated by taking the 1997 per capita steel can supply rate (21 pounds per person), multiplied by the anticipated North Carolina population for the next five years.

Recovery

Based on surveyed results from North Carolina's private recycling industry and local governments, the estimated total quantity of steel cans recovered in North Carolina in 1997 was 8,383 tons. This translates into an 11 percent recovery rate statewide. In Figure 2, the quantity of steel cans recovered for 1998-2002 is based on the 1997 per capita recovery rate (2.25 pounds per person), adjusted for future population estimates, assuming the recovery rate remains constant. The national recovery rates are presented in Figure 3 along with recovery rates for North Carolina. According to the Steel Recycling Institute's April 1998 press release, the national recycling rate for steel cans for 1997 was 60.7 percent. This includes the recycling of paint, aerosol, food, and beverage cans.

The recovery rate for steel cans in North Carolina remains low because of the number of communities that do not include them in their existing recycling programs. Out of 381 communities that reported providing a recycling service to residents in fiscal year 1996-97, 134 of them did not include steel can recycling either through curbside or drop-off services. Thus, 35 percent of the existing recycling programs in North Carolina do not currently include steel cans. There is no indication as to the reason why these programs do not currently include the material, and also have no indication of the number of communities expected to add steel cans to their program. Thus, the estimated recovery rates through 2002 are based only on the current per capita recovery rates adjusted for future population estimates. Additionally, as a residential collection method for steel, resource recovery (waste to energy or incineration)

Figure 3: Estimated North Carolina and National Recovery rates for Steel Cans

	1991	1992	1993	1997
Estimated NC Recovery[1]	3.9%	6.1%	10.5%	11%[2]
Estimated US Recovery[3]	34%	40.9%	48%	60.7%

Sources: 1) SCS 1995 Markets Assessment
2) North Carolina Recycling Survey
3) Steel Recycling Institute

Figure 4. Total Steel Recovery (in million metric tons)

	1992	1993	1994	1995	1996
Apparent Domestic Steel Supply[1]	139	167	178	180	183
Recycled[2]	63	68	70	72	72
Percent Recycled	45%	41%	39%	40%	39%

Source: U.S. Geological Survey.
1) Production plus net imports plus stock changes. Production is primary production plus recycled metal.
2) Metal recovered from new plus old scrap.

continues to play a strong role. Of the 114 facilities in the United States, 96 recover household steel for recycling. Nearly 38 million people have their steel cans and other household steel "automatically" collected through these plants. The annual tonnage of steel magnetically recovered is about 775,000 tons.[5] This represents 46 percent of the total national recovery.

North Carolina has only one small-scale incinerator operated by New Hanover County, which recently began privatized post-burn ferrous (steel) recovery from their plant. Thus, the state is at a relative disadvantage to those which have a majority of their ferrous metals "automatically" separated. The current landfill disposal fees in North Carolina are lower than the per ton fees needed to support large scale waste to energy or incineration. With no indications of that changing, it can be assumed that no drastic changes will occur with steel can recovery by automatic separation.

Other Steel Scrap

The total amount of all steel materials recycled nationally in 1997 was 70 million metric tons. Obsolete scrap made up an estimated 46 percent (32.2 million metric tons) of the total scrap recovered. The 1.7 million tons of steel cans recovered through recycling represents only five percent of the total obsolete scrap recycled domestically in 1997. The largest sources of obsolete scrap are junked automobiles, demolished structures, worn-out railroad cars and tracks, appliances, and machinery.[6]

Figure 4 shows the total amount of all steel generated and recovered domestically from 1992-1996. It is important to note that most steel products are durable goods. Thus, the quantity of steel produced is not equal to the quantity of steel ready for disposal that same year. The recent decrease in the percentage of steel recycled is due to the significant increase in the total apparent domestic steel supply, which is mainly made up of durable steel products that will not enter the waste stream for many years.

Steel Scrap Imports

Since metals are traded nationally and internationally, information pertaining to the amount of imports coming directly to North Carolina trade ports is less relevant than the total supply of scrap being imported nationally. The total amount of scrap imports is displayed in Figure 5. The quantity of steel cans imported into the United States is relatively low, and is not differentiated from other types of ferrous scrap imports, as reported by the U.S. Census Bureau Foreign Trade Division.

DEMAND

Like most recyclable commodities, the value of steel scrap is driven by the demand for finished products. If the demand continues to expand, then the need for more scrap steel will be eminent. The demand for steel typically is

Figure 5: Iron and Steel Scrap Imports/Exports (million metric tons)

	1993	1994	1995	1996	1997
Imports	1.6	1.9	2.3	2.9	3
Exports	10	9	10.5	9.1	9
Net Exports	8.4	7.1	8.2	6.2	6

Source: U.S. Geological Survey

Figure 6: Raw Steel Production in BOFs and EAFs.

	1993	1994	1995	1996	1997
Basic Oxygen Furnaces	61%	61%	60%	57%	53%
Electric Arc Furnaces	39%	39%	40%	43%	47%

Source: U.S. Geological Survey

dictated by the demand for automobiles. However, efforts are underway to stimulate the growth of other steel markets. For instance, the steel industry has set a goal that, by the year 2002, steel-framed homes will represent 25 percent of all new residential construction projects.[7]

Also, recent changes in steel production have resulted in a dependence on scrap. A new type of steel mill has evolved, called a Mini Mill, which uses the electric arc furnace that requires scrap, and cannot use unprocessed iron ore. As more steel is produced worldwide in electric furnaces and as integrated mills increase usage of scrap in blast furnaces, demand for scrap supplies will increase.[8] Figure 6 shows the percentage of raw steel produced by both the basic oxygen furnaces (BOFs) and the electric arc furnaces (EAFs). The percentage produced at EAFs has increased significantly (eight percent) in the past four years. One reason for this trend is that EAFs generally are smaller and significantly less costly to start up that traditional mills.[9]

Exports

Similar to imports, steel can scrap exports are minimal, and are not tracked separately from other steel scrap by the U.S. Census Bureau Foreign Trade Division. However, because prices of steel cans are developed in part by the demand for all other steel scrap, its international demand is important to consider.

The export market has traditionally been a large determinant of the demand for all scrap. (See Figure 5.) The historic flow of material has been from more developed countries to less developed countries. Recently, however, that trend began to change. Domestically, scrap demand will increase as mills under construction along the Mississippi River are completed, which will cause scrap exports to decrease and imports to increase.[10] As new mini-mills sprout up in the Southeast and Midwest regions of the United States, scrap that was formerly shipped overseas is staying in North America. In 1986, 1.5 million tons of scrap was exported through the port of New Orleans. Since 1994 that average has dropped to fewer than 100,000 tons per year. Increased domestic demand from steel mills combined with weak Asian markets means less ferrous scrap is being shipped outside North America.[11]

Specifications

The characteristic quality and consistency of steel can scrap helps increase its demand. Magnets are used to easily separate the steel from other recyclable materials, ensuring mills of a homogenous commodity. Also, the chemical composition of all steel cans is very similar, allowing the mills to easily re-melt the scrap into specific products.

The specifications for "Bundled Steel Can Scrap" are defined by the Institute of Scrap Recycling Industries, Inc., as being steel can scrap compressed to charging box size and weighing not less than 75 pounds per cubic foot. Cans may be baled without removal of paper labels, but free of other non-metallics. They may include up to five-gallon tin-coated containers.[12]

Figure 7: Major Local End-Users

End-User	Location	Current Capacity (tons per year)	EAF / BOF
Bethlehem Steel	Sparrows Point, MD	4M	BOF
	Steelton, PA	1.2M	EAF
U.S. Steel	Pittsburgh, PA	3.0M	BOF
	Fairfield, AL	2.2M	BOF
Nucor Steel	Darlington, SC	750,000	EAF
	Hertford County, NC[1]	1M	EAF
	Berkley, SC	1M	EAF
SMI -Owen Steel	Cayce, SC	65,000	EAF
TXI - Chaparral Steel	Dinwiddie, VA[2]	1M	EAF
TOTAL		14,215,000 TPY	

1) Anticipated mill opening in 2000.
2) Anticipated mill opening in mid 1999.
Source: Steel Recycling Institute

Figure 8: Estimated Steel Can Consumption of Major Local End Users

Mill Type	Total Capacity (Tons)	Percent of Annual Tonnage	Total Estimated Quantity of Steel Cans Consumed (Tons)
BOF:	9,200,000	1.50%	138,000
EAF:	5,015,000	3.00%	150,450
Total:	14,215,000	2.03%	288,450

Major End Users

Since North Carolina does not have any mills accepting steel cans, it is necessary to look at the surrounding states' mills, and their existing capacity. Figure 7 outlines the major end-users. While the demand from these mills ultimately drives the demand for the steel cans in North Carolina, it is the various local processors that enable the materials to get to market. An adequate processing infrastructure exists throughout the state with balers and shredders, which work to increase the density of scrap metal for shipments over very large distances.

The Steel Recycling Institute estimates that the amount of steel cans consumed is approximately 1.5 percent of the annual capacity in BOFs, and 3.0 percent in EAFs.[13] Figure 8 shows the estimated steel can consumption of the Major End Users listed in Figure 7.

SUPPLY / DEMAND RELATIONSHIP

The demand for steel can scrap continues to exceed the supply both nationally and locally. Because of the adequate existing capacity and the anticipated increase in electric steel production in EAFs, the ability to increase steel can recycling is not dependent upon future capacity increases. Even if the supply of scrap recovered through recycling increases, the total demand for all steel scrap will still exceed the small portion provided through steel can recycling.

Figure 9: Steel Can Prices

Clean Steel Cans	1993	1994	1995	1996	1997
Quarter 1 (March)	$83.50	N/A	$50.00	$60.00	$57.50
Quarter 2 (June)	$72.50	N/A	N/A	N/A	$61.00
Quarter 3 (Sept)	$71.50	N/A	$55.00	$57.50	$65.00
Quarter 4 (Dec)	N/A	N/A	$55.00	$42.50	$65.00
Average	$75.83	$69.73	$53.33	$53.33	$62.13

Source: Recycling Times "The Markets Page"

Additionally, the domestic increase in demand for scrap will ensure solid local markets. Relying less on scrap exports will allow the United State's steel scrap markets to be somewhat protected against global economic downturns such as the recent decline in the Asian economy. Domestic demand acts as a safeguard against such events, provided the finished products are demanded locally as well.

The prices for steel can scrap (end user prices) in the Southern Region of the United States are presented in Figure 9. Any increases or decreases in the prices are directly related to the supply and demand for finished steel products. After a decrease in prices from 1993 through 94, the prices have begun to rebound as the demand for steel products continues to strengthen. The average price for steel cans for 1993 through 1997 was $62.87 per ton.

CONCLUSION

The markets currently exist for the consumption of additional amounts of steel cans and other steel scrap generated in North Carolina. With approximately 90 percent of the supply of steel cans remaining in the waste stream (approximately 70,000 tons), there is a good opportunity for new or existing recycling businesses to capture the remaining share. At the average 1997 price of $62.13 per ton, the 70,000 tons of steel cans would have a value of $4,349,100.

As long as the market for finished steel products continues to grow, the prices for scrap will remain strong and allow steel cans to be a self-supporting recyclable commodity. Short-term fluctuations in the demand for steel products may slightly skew the prices for steel cans and other types of steel scrap, but the cost avoidance and potential revenue generation from recycling still outweighs disposal.

It is apparent that the breakdown in steel can recycling is not due to the lack of industry capacity, but rather the lack of adequate means of collection. The following recommendations are designed to support development of a viable collection infrastructure.

RECOMMENDATIONS

- The state should identify the reasons why certain municipalities and counties do not include steel cans in their existing recycling programs.
- The state needs to work with the steel recycling trade associations to help educate the municipalities and counties on the potential cost avoidance and revenue generation from such a program.
- As communities enact volume based or pay-as-you-throw residential programs, steel cans need to be an element of the materials collected as part of the mix of recyclables.
- Additionally, alternative sources of material should be identified. Some of North Carolina's largest cities have a significant number of their residents living in multi-family apartment complexes. The state should consider conducting a study to determine the potential quantities of all recyclable materials that could be collected if they were included in traditional residential curbside collection. Many steel cans are also generated at foodservice operations on military bases, schools (public and private), colleges and universities, commercial food establishments, and state and federal prisons. Steel can collection at these institutions is easily integrated into a multi-material recycling program infrastructure.

[1] Michael Fenton. *Recycling Metals.* U.S. Geological Survey. Minerals Information. 1996. p. 6.
[2] Ibid.
[3] Steel Recycling Institute. *News Release*. 1998.
[4] Personnel communication, The Steel Recycling Institute. August 3, 1998.
[5] Crawford, Gregory L. "Steeling for Major Recycling Gains." Resource Recycling. June, 1998. p. 44-45.
[6] U.S. Geologial Survey. "Recycling-Metals." Minerals Information Team. 1996. Table 1.
[7] Crawford, Gregory L. "Steeling for Major Recycling Gains." *Resource Recycling*. June 1998. p. 44-45.
[8] Harler, Curt. "U.S. Ferrous Scrap Flow Undergoes Changes." *Recycling Today*. January 1998. Ferrous Scrap Supplement. p. 8.
[9] Personnel communication, The Steel Recycling Institute, August 3, 1998.
[10] Fenton, Michael. *Iron and Steel Scrap*. U.S. Geological Survey. Minerals Information. 1996. p. 3.
[11] Harler, Curt. "U.S. Ferrous Scrap Flow Undergoes Changes." *Recycling Today*. January 1998. Ferrous Scrap Supplement. p. 8.
[12] Institute of Scrap Recycling Industries, Inc. *Scrap Specifications Circular*. 1998. p. 17.
[13] Personnel communication, SRI. August 3, 1998.