

Impact of Metal Hangers on Landfills: Case Study

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Abstract – The 1990 Georgia Comprehensive Solid Waste Management Act set a 25% solid waste reduction goal statewide by 1996. A recent study indicated a 28% increase in the solid waste disposal rate per capita for the State. This study was conducted with undergraduate students to evaluate the impact of disposing metal hangers on landfills in the Atlanta Metropolitan area. The paper discusses the variation of utilization rates depending on type of garment, and household income, and the current individual disposal alternatives and their economical impact on landfills. Results of this study also indicate that approximately 123 million hangers per year are disposed on landfills. These hangers contribute annually with 3,430 metric tons of refuse material to the local landfills.

Keywords: metal hanger, non-ferrous metals, landfill,

Introduction

Solid wastes are produced by humans and other creatures as part of the daily activities. Solid wastes, as defined by the US EPA [1], include durable goods, containers and packing material, food wastes, yard wastes and miscellaneous inorganic wastes from residential, commercial, institutional and industrial sources. Inappropriate disposal of solid wastes could contribute to epidemics of great proportions, such as the Black Death in 1300. Consequently, engineered methods to dispose of solid waste have been implemented since the first hole-in-the-ground started in 1935 in California [2].

Federal and state legislation has been passed to assist communities in the development of more efficient methods of solid waste disposal, as well as to reduce the impact on public health. The disposal of non-hazardous waste is regulated by the State of Georgia under the 1990 Georgia Comprehensive Solid Waste Management Act. The same act set a disposal reduction goal statewide of 25 percent per capita to be achieved by 1996. However, the solid waste disposal rate increased from 5.56 pounds per person per day to 7.14 pounds per person per day for the 1993 to 2003 period [3].

In order to reduce the amount of material disposed off in landfills, local, state and national authorities around the world have established programs promoting waste reduction, reuse and recycling, known as the 3R. The 3R philosophy emphasizes the reduction of the amount of material discarded by individuals or commercial and industrial generators; the reuse of containers and products, or the repair of products for further use; and the recycle of materials or products as much as possible. In the State of Georgia despite the efforts to increase recycling and waste reduction, as reported by R.W. Beck [3], the amount of waste sent to landfills has increased in the last decade.

This study was conducted with senior students in the Civil Engineering Technology Department of Southern Polytechnic State University, as part of the Solid Waste Management course. The focus of this study was on the impact of metal (wire) hangers on the quality of solid waste and the economical impact of disposing them on local

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landfills. Metal hangers are typically accumulated by users for different lengths of time or disposed off immediately in the garbage can. Those accumulated eventually end up in the garbage can.

Problem Statement

Based on the Georgia Statewide Waste Characterization Study [3], approximately 66% of the waste going into the State landfills is municipal solid waste (MSW). This MSW includes paper, plastic, glass, metal, organic, inorganic, and construction refuse. Metal hangers are included in the non-ferrous fraction of the metal component of MSW. The non-ferrous metals represent 0.7% of the residential fraction of MSW in the State of Georgia. This fraction is approximately 5 times higher than the values reported by the New York City Department of Sanitation [4]. The NYC Department of Sanitation reported that the non-ferrous metal content of the residential solid refuse is approximately 0.12%. Although the fraction of non-ferrous metals in the MSW for the State of Georgia is very low, it is important to evaluate the economical impact of the disposal of non-ferrous metals in landfills, if they are not reused or recycled.

We selected to evaluate the economical impact of disposing metal hangers as solid refuse in the landfills in the northern part of the state; because contrary to other cities or states, Atlanta or the State of Georgia do not seem to have policies to reuse or recycle metal hangers [5]. The review of practices in several states, such as Arizona, California, Colorado, Illinois, New York, North Dakota, Oregon and Texas revealed that either by individual or state promoted initiatives, used metal hangers are accepted by cleaners for reuse. To assess the impact on local facilities, it was necessary to estimate the amount of metal hangers disposed in landfills. Two surveys were developed to determine the amount of hangers used per capita. One of the surveys was given to dry cleaning customers or potential customers. The second survey was prepared to obtain information from the cleaners.

Data Collection

The customer survey was distributed to friends and relatives of students in the Civil Engineering Technology Department, and students in the Science, Technology and Society courses. This instrument was designed to obtain information on the number and type of garments sent to the cleaners per month, household income, and cost of dry cleaning per garment, as well as the fate of hangers. A total of 125 surveys were collected, but only 62 provided all the information requested. Table No. 1 summarizes the data generated with the customer survey.

Table No. 1. Number and Type of Garments Taken to Dry Cleaning and Frequency of Service

Question	Average
How many times per month do you take garments to the cleaners?	2.18
How many pieces per trip?	7.23
How many adults are in your household?	2.2
Type of Garments	
Shirt/Blouse/Jacket	4.64
Pants/Skirts	3.43
Bed linens	1.5
Other	4.5
Do you keep hangers from the cleaners?	
Yes	41
No	27
If you do not keep the hangers, what do you do with them?	
Put in the trash	20
Recycle	2
Give away	2
Back to Cleaners	5
Other	4

The response to the survey prepared for managers or owners of dry cleaning services was minimal. The dry cleaners contacted for this study were not willing to provide information.

In addition to the number of garments, and therefore the number of hangers used per capita and per year, it was important to obtain information on the total weight of hangers disposed off in the landfills. The composition of the hangers depends on the type of garment. For example, shirt, blouses and jackets are hanged on metal hangers with or without paper protection; while pants and skirts are hanged on hangers with cardboard tubes. Consequently, samples of at least three types of hangers were collected and analyzed for unit weight, paint content by weight, lacquer content by weight, and paper and cardboard weight. In order to find the amount of paint by weight present on hangers, three hangers were placed on an analytical balance and their individual weights were recorded. The paint or lacquer of each hanger was removed using sand paper and weighed again. Table No. 2 summarizes the weight of the different types of metal hangers used by dry cleaning services; while Table No. 3 contains the weight contribution of the non-metal components of the different type of hangers.

Table No. 2. Weight of Different Types of Metal Hangers Used in Dry Cleaning

Hanger Type	Weight (g)
<i>Shirt/Blouse/Jackets</i>	
Clear lacquer	25.70
White paint	25.59
Black paint	26.75
Clear lacquer with paper protection	39.54
<i>Pants/Skirts</i>	
Clear lacquer with cardboard tube	35.51

Table No. 3. Weight of Non-metal Components of Metal Hangers Used in Dry Cleaning

Non-metal Component	Weight (g)
Cardboard tube	17.79
Paper protection (cover)	4.64
Clear lacquer	0.05
Paint (average)	0.09

In order to assess the impact of the disposal of metal hangers in landfills, it was also necessary to determine the population of the Atlanta metropolitan area. This analysis included Cherokee, Clayton, Cobb, DeKalb, Fulton, Gwinnett, Henry, Paulding and Rockdale counties. Table No. 4 contains the 2004 population projections made by the U.S. Census Bureau [6] for the counties included in this study.

Table No. 4. Population Estimates for Georgia Counties

County	Census 2000	Estimate, 2004
Cherokee	141,903	174,680
Clayton	236,517	264,951
Cobb	607,751	654,751
DeKalb	665,865	675,725
Fulton	814,438	816,006
Gwinnett	588,448	700,794
Henry	119,341	159,506
Paulding	81,678	105,936
Rockdale	70,111	76,831

Data Analysis

The results of the customer survey show that the metal hanger utilization rate is approximately 86 hangers per capita and per year. Based on census data, the 2004 population estimates, and assuming linear growth in each of the nine counties for the 2004-2006 period, the overall population for the region in 2006 would be approximately 3,780,744. According to the General Demographic Characteristics for Georgia [7] in 2000, 63.9% of the population is between 18 to 65 years of age, which is the population group that typically uses dry cleaning services frequently. The Profile of Selected Economic Characteristics of the State of Georgia for 2000 [7] indicates that approximately 59.2 % of the population has a household yearly income greater than \$35,000, which is the fraction of the population

most likely to use dry cleaning services. These factors were considered in the estimation of the amount of metals hangers being disposed in local landfills. Tables No. 5 and 6 summarize the amount of metal hangers, type of hangers and total weight of non-ferrous metals, cardboard, paper and paint estimated based on the projected population for 2006, the age group and the household income.

Table No. 5. Total Amount of Metal Hangers Used in the Atlanta Metropolitan Area, 2006

Item	Value
Total number of hangers used	123,000,000
Shirt/Blouse/Jacket	40,550,000
Pants/Skirts	29,990,000
Bed linens/other	52,460,000

Table No. 6. Total Weight of Non-ferrous Metal and Cardboard and Paper Used on Metals Hangers in the Atlanta Metropolitan Area, 2006

Hanger type	Weight (kg)
<i>Shirt/Blouse/Jacket</i>	<i>1,604,000</i>
Non-ferrous metal	1,412,000
Paper	188,200
Paint/lacquer	3,800
<i>Pants/Skirts</i>	<i>1,064,500</i>
Non-ferrous metal	528,700
Cardboard	533,600
Paint/lacquer	2,700
<i>Bed linens/others</i>	<i>1,364,000</i>
Non-ferrous metal	1,359,000
Paint/lacquer	5,000

The customer survey shows that approximately 60.3% of the hangers are kept by the user, and of those who do not keep the hangers only 15% will return them to the cleaners. Consequently, it is safe to assume that 85% of the total hangers used (approximately 105,000,000) would end up being discharge into the garbage can, and subsequently disposed off in a landfill. Table No. 7 contains a summary of the estimated amount of material that might be disposed off in landfills of the Atlanta Metropolitan Area.

Table No. 7. Composition of Metals Hangers Disposed off in Landfills in the Atlanta Metropolitan Area, 2006

Component	Weight (kg)
Non-ferrous	2,805,000
Cardboard	453,500
Paper	160,000
Paint/lacquer	9,800

Based on data provided by dry cleaning managers [8] each hanger costs approximately \$0.05, thus the cost of the hangers disposed in a landfill is approximately \$4,200,000 per year. The overall economical impact will be greater than \$4,200,000 per year, because transportation and personnel costs should be added, but these costs were not available for us.

Conclusions

Based on the information provided by dry cleaning users, population data and several assumptions made in the analysis of solid waste generation rates, approximately 3,500 metric tons of hangers may be disposed yearly on landfills around the Atlanta Metropolitan Area. Although this amount is minimal with respect of the total amount of refuse, approximately 4,500,000 metric tons, generated for the same period; there is a significant cost associated with the disposal of this material.

At the time this case study was conducted, it was impossible to obtain the actual composition of the non-ferrous component of the hangers, despite the efforts made to obtain this information from the manufacturers. In addition,

the Atlanta Metropolitan area does not have a policy regarding the reuse of metal hangers by dry cleaning companies. Thus, it difficult to assess the economical benefit of recycling the metal associated with the hangers.

References

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