Oil-Related: Used Oil Filters

COMMODITY PROFILE

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

MARKETS ASSESSMENT 1998

OVERVIEW

According to the Filter Manufacturers Council (FMC), each motor vehicle in North Carolina generates an average of two used oil filters per year.[1] With nearly six million industrial, commercial, and passenger vehicles registered with the state Division of Motor Vehicles in 1997, more than 11.7 million light duty oil filters were generated in North Carolina. Moreover, because restrictions for disposing filters in landfills are lacking, only 20 percent of used oil filters were recovered in North Carolina in 1997.

Currently, North Carolina law exempts all non-terne plated oil filters from hazardous waste regulations if the filter has been hot drained through one of the following methods: 1) punctured through its dome or anti-drain back, 2) crushed, 3) dismantled, or 4) drained via any other equivalent hot-draining method that removes the used oil.[2, 3] Before draining, a used oil filter can contain as much as 16 ounces of used oil. After hot draining, a filter can still contain between 3.5 and eight ounces of used oil.[4]

Contamination from residual oil in oil filters presents a threat to the state's environment and natural resources. In its research on the potential impacts of used oil, the United States Environmental Protection Agency (EPA) has identified several environmental risks posed by improper disposal methods. Specifically, the EPA estimates that one gallon of used oil can pollute more than one million gallons of drinking water. Small amounts of used oil that accumulate on water bodies also can prevent oxygen and sunlight from entering the water, thus reducing plant and animal life in lakes, ponds, and rivers. Additionally, used oil dumped in drains often accumulates in small concentrations in water treatment plants and creates a severe detriment to sewage treatment processes.[5]

This report focuses on the recycling opportunities represented by the 3,800 tons of steel and at least 250,000 gallons of used oil contained in the more than nine million filters that currently may be disposed in North Carolina.[6] This report assesses the relationship between the supply

Figure 1: Total Oil Filters Sold for Motor Vehicle Uses in North Carolina 1994, 1997 and 2002

	1994	1997	2002
Oil Filters from all Motor Vehicles	10,768,684	11,709,890	13,415,672
A. Other Motor Vehicle Consumers	5,384,342	5,854,945	8,049,403
B. Do-It-Yourself Sources	5,384,342	5,854,945	5,366,269

Source: Based on data from the Filter Manufacturers Council, 1996

and demand for used oil filters in North Carolina. Toward this end, the report focuses primarily on analyzing the market areas with the largest amount of uncollected filters and with the greatest potential for recovery and recycling. According to feedback from recycling companies in the Southeast region, there are sufficient markets for all three components of used oil filters: the steel shell, the paper filter media, and the residual used oil.

SUPPLY

Generation

Data were lacking on used oil filter generation and consumption in North Carolina. For this reason, generation is calculated in two steps. The first step involves estimating the amount of oil filters sold in North Carolina in 1997. Second, the consumption of filters is allocated to the two main types of oil filter consumer groups.

Step One: Oil Sales

To estimate the amount of used oil filters generated in North Carolina, this analysis references data from a study conducted by FMC in 1996.[7] To estimate the number of filters sold in 1997, the average number of oil filters sold per vehicle was multiplied by the number of vehicles registered in North Carolina that year. With an average of 1.99 filters sold per vehicle and 5.8 million registered vehicles, approximately 11.7 million light duty filters were sold in North Carolina in 1997 (see Figure 1).

Step Two: Consumer Groups

The two main consumer categories of oil filters from motor vehicle sources are do-it-yourself (DIY) oil changers and all other motor vehicle (OMV) consumers. DIY generators consist primarily of people who change their own oil at residences and are then responsible for disposing of the used oil and filters. OMV generators constitute a broad class of consumers, including people who bring their automobiles to quick oil change facilities, dealerships, or service stations. In addition, the OMV category includes used oil generated from commercial and government fleets, rental car operations, and other establishments that generate used oil.

Based on previous research, the American Petroleum Institute (API) estimates that DIY oil changers constitute approximately 50 percent of the motor vehicles and used oil filters generated in North Carolina. This assumption is based on a national average and may underestimate the percentage of DIY oil changers in North Carolina. The state exhibits three characteristics that make a higher portion of DIY changers likely: 1) a more rurally based population, 2) a warm climate, and 3) a younger population (older Americans are less likely to change their own oil).[8] Given the warm climate and the relatively balanced rural and urban population, it is estimated that DIY sources are responsible for roughly 50 percent of used oil filters in North Carolina (Figure 1). However, because of an increasing urban population base and the rapid expansion of quick oil change outlets, the percentage of DIY oil changers is expected to decrease two to five percent per year in the short term future.[9] Estimates in this analysis reflect a two-percent average annual decrease in DIY consumers from 1997 to 2002. Because of the decreasing percentage of DIY consumers by 2002 more than eight million filters will be generated by OMV sources.

Recovery

Based on a survey of recycling businesses in 1998, 20 percent of used oil filters from all motor vehicle sources were recovered in North Carolina in 1997 (Figure 2). A majority of the 2.3 million used oil filters recovered from motor vehicles were collected from commercial fleets, quick oil change outlets, and auto parts stores. As a result, approximately nine million filters remain unaccounted for and may be discarded in landfills throughout the state.

To discover the potential sources of unrecovered used oil filters, it is necessary to analyze the recovery of OMV and DIY oil streams separately.

Other-Motor-Vehicle Sector

Based on information gathered from a survey conducted by the North Carolina Division of Pollution Prevention and Environmental Assistance (DPPEA) in 1997, the recovery of used oil filters from the OMV sources (quick oil chang-

Figure 2. Recovery of Used Oil Filters from Light Duty Motor Vehicles in North Carolina, 1997 and 2002

	1997	2002
Total Oil Filters Generated (Sold)	11,709,890	13,415,672
Total Filters Recovered	2,334,031	3,109,788
Recovery Rate	20%	23%
Unaccounted for Used Oil Filters	9,375,859	*10,305,884*
Residual Used Oil from Unaccounted Oil Filters	256,372 gallons	*281,801 gallons*

Figure 3: OMV Used Oil Filters Recovered in 1997 and 2002

	1997	2002
OMV Used Oil Filters Generated	5,854,945	8,049,403
Total OMV Recovery	2,118,531	2,912,274
Percent Recovered	*36%*	*36% (assumed)*
Unaccounted for OMV Used Oil Filters	3,736,414	*5,137,129*
Residual Oil in Unaccounted for OMV Used Filters	102,168 gallons	*140,468 gallons*

Figure 4: DIY Used Oil Filters Recovered in 1997 and 2002

	1997	2002
DIY Used Oil Filters Generated	5,854,945	5,366,269
Total DIY Recovery	215,500	197,514
Percent Recovered	*4.00%*	*4.00% (assumed)*
Unaccounted for DIY Used Oil Filters	5,639,445	*5,168,755*
Residual Oil in Unaccounted for DIY Used Filters	154,204 gallons	*141,333 gallons*

ers, private fleets, rental cars, and state government vehicles) occurs almost exclusively through private sector channels. For example, while only six local governments collected oil filters in 1997, private businesses collected more than two million filters. The recovery rate for used oil filters from all OMV sources reached 36 percent of generation in 1997 (Figure 3). Assuming a constant recovery rate for the next five years, more than five million oil filters from quick oil change outlets, private fleets, rental cars, and government sources will be discarded into landfills in 2002. Moreover, because of the 3.5 ounces of residual oil contained in each of the 3.7 million used oil filters from OMVs, more than 102,000 gallons of used oil were disposed in landfills in 1997.[10]

Do-It-Yourself (DIY) Sector

With only 215,000 filters recovered from DIY generators in 1997, the recovery rate for this sector is approximately four percent. Local government collection efforts were limited to six localities in 1997. While there may be some small sources of private sector recovery of DIY oil filters not included in this report, existing data reveal the DIY sector is responsible for more than five million unaccounted filters in 1997 (Figure 4).

Even when DIY generators employ the state mandated best drainage practices, as much as 3.5 ounces of oil remain in each of the five million used filters that are unaccounted for from these sources. Cumulatively, the five million filters could have resulted in 154,000 gallons of used oil being discharged into North Carolina's landfills in 1997.[11] Combining DIY and OMV sources results in about 256,000 total gallons of residual oil contained in filters.

Source Reduction

Fewer oil changes means less waste oil released into the environment. Because of improvements in the design of motors during the past 10 years, most major automobile manufacturing companies have decreased the recommended frequency of oil changes. (See the *Used Oil Commodity Profile* for more information.) An increase in the minimum distances between oil changes of just 2,000 miles could result in as much as a 30 percent reduction in the generation of used oil filters.

By-pass filters are another important source reduction option. Preliminary studies indicate the average oil life used in combination with a by-pass filter is 130,000 miles.[12] The state could demonstrate leadership in this area by installing by-pass filters in all state government vehicles. Local governments also could be encouraged to install by-pass filters on fleets.

Increasing Filter Recovery

Many states have initiated used oil recycling programs based on the API Model Bill. This model bill establishes guidelines for a state-used oil fund supported by a fee on oil sales (usually two cents per quart). The fund normally is used to provide grant funding for cities and towns wishing to establish or publicize new oil and filter drop-off centers or curbside collection programs. In addition, many states use the funds to support a toll-free telephone information center and state-sponsored promotions. South Carolina uses some of its state funds for a multi-media advertising campaign, which includes print material, a school curriculum, and television and radio advertisements with NASCAR celebrities. Many of the state's educational programs are focused on raising the awareness of DIY oil changers.

North Carolina has established the need for used oil and filter recycling programs in state statutes. In General Statute Act 309.16, the state proposed to support a public education program regarding used oil collection and recycling through the provision of financial and technical resources. In General Statute Acts 309.21 and 22, the state also committed to providing the funding and expertise necessary to initiate an incentive program for individuals who change their own oil. In addition, the Statute proposed supporting a grants program to encourage new local government curbside collection initiatives and the establishment of additional private used oil collection centers. Funding was never appropriated for these programs, therefore they were never implemented.

Increasing Oil Recovery

Data suggest that, because of residual oil contained in used oil filters, the state cannot consider the landfill ban for used oil complete until used oil filters are also banned from disposal. Recent studies have revealed that the amount of used oil contained in oil filters varies from 3.5 to eight ounces depending on drainage practices. Assuming the best possible drainage practices were employed in 1997, more than 256,000 gallons of used oil were still disposed along with the 10 million filters. This significant amount of used oil entering landfills clearly violates the intention of the law banning used oil disposal. Banning the disposal of filters would reduce the potential environmental hazards and bolster the developing filter recycling infrastructure.

While a more detailed cost/benefit analysis is necessary for further consideration of an oil filter ban, initial calculations reveal that collection and recycling of the nine million currently disposed filters would cost generators approximately $2.2 million in additional hauling charges.[13] This cost would be offset partially by the average retail purchase expenditure of $6.50 from each individual who returns filters to an auto parts retail outlet.[14] For example, if 25 percent of the 5,639,445 unaccounted for filters from DIY oil changes were collected at auto parts retail outlets, nearly $9.2 million dollars in additional sales would occur. In addition, the growth of North Carolina's steel recycling economy (in revenue and employees) would also offset the increased hauling costs of mandatory filter recycling.

While the state bears responsibility to protect the natural resources of the larger environment, local governments also can take initiative to respond to potential threats to their watersheds and groundwater, drinking, and recreational water supplies by banning the disposal of used oil filters in their local landfills.

DEMAND

Because of the relatively recent emergence of the oil filter recycling industry, limited quantitative information exists on the demand for filters from North Carolina. The following demand analysis is based on communications with firms that collect, transport, or process used oil filters from North Carolina.

Used oil filters contain three recyclable elements: used oil, a paper filter media, and a steel shell. The steel shell is the most marketable element. The two primary end users for used oil filters are steel mills and scrap metal recovery operations. While North Carolina has very strong markets for used oil and recycled steel, currently, there is only one major end user of paper filters in the state.

Steel

Filtech Filtration Products, located in Monroe, North Carolina, is the oldest and largest processor of used oil filters in

the region. In 1997, Filtech processed approximately three million filters, mostly from North Carolina sources. Because of their high volume shredding technology, the plant currently has the capacity to process approximately 10 million used oil filters, or the equivalent of all of North Carolina's unaccounted for filters. Moreover, Filtech processes, separates, and markets all three components of used oil filters: the scrap steel, used oil, and paper filter media.

In addition to selling recycled steel to one of three large steel mills in the region, Filtech also sells approximately 100,000 gallons of used oil to Noble Oil Services for reprocessing and resale. Three regional mills currently consuming the largest percentage of recycled steel from oil filter processors are Charlotte Pipe and Foundry (North Carolina), Nucor (South Carolina), and SMI (South Carolina). Because of extremely large volumes of steel raw material purchases, recycled oil filter steel make up less than one percent of the input for any of the mills. While the high quality of steel in oil filters is attractive to steel production, mills do not accept recycled steel contaminated by the paper filter media. Although small amounts of residual oil can be consumed in furnaces, paper media is prone to floating when incinerated and has the potential to create a fire hazard. Massive quantities of recycled steel demanded by regional steel mills provide sufficient future demand to absorb significant increases in the recovery rate of used oil filters.[15]

Used Oil

As mentioned in the report on used oil, there is tremendous demand for used oil from North Carolina. Specifically, the majority of used oil in the state is used to produce fuel oil for industry. In most oil recycling operations, used oil is processed by removing contaminants and adding some virgin oil to produce oil suitable for burning in industrial boilers. For information on specific end users, refer to the *Used Oil Commodity Profile*.

Paper Filter Media

Currently, Giant Resource Recovery is the largest end user of the paper media in used oil filters. The company uses the paper media as a fuel in its cement kilns. While Giant Resource Recovery currently consumes most of the paper media recovered in the state, other fuel-to-energy end users could be identified if recovery levels increase in the future.

SUPPLY / DEMAND RELATIONSHIP

The demand for recycled filter products is influenced by the price and demand for competing products derived from virgin materials. In the case of used oil filters, markets for virgin steel and crude oil heavily influence the demand for steel scrap and used oil.

Based on information from transporters, processors, and end users of used oil filters, the demand for recycled steel from used filters currently exceeds the supply in the region. More specifically, steel mills have such large demand structures that a 50-percent increase in oil filter recovery would provide a nominal amount of recycled steel relative to their total raw material needs. As a result of high quality steel in oil filters, it appears the demand for recycled steel in the region is more than sufficient to absorb potential increases in used oil filter supplies.

Similarly, processors of used oil in North Carolina acknowledge the demand for fuel oil is already well above the current supply.[16] In addition, the demand for re-refined motor oil is expected to double within five years. While the supply of paper media currently is being absorbed by one primary end user, industry experts expect additional fuel-to-energy uses to emerge as the supply of paper filter media increases.[17] Therefore, through a combination of the three end uses, it appears that current and future demand for recycled steel, used oil, and paper fuel provide the potential to absorb significant increases in the supply of used oil filters from both the DIY and OMV sectors.

Given the significant amount of filters not collected from DIY and OMV sources, the current supply of used oil filters can be characterized as well below the potential demand. In fact, with more than nine million uncollected filters from motor vehicle sources, there appears to be significant potential to increase in supply.

CONCLUSION

More than 256,000 gallons of residual oil from oil filters may have entered North Carolina landfills in 1997. With projections of continued population growth in North Carolina during the next few decades, the issues of proper oil and filter management will become increasingly critical to preserving the integrity of the state's environment and natural resources.

First and foremost, efforts should be made to increase public awareness of higher oil change intervals, which would greatly reduce the amount of used oil and filters generated. Additionally, given the projection of a steady decrease in future DIY oil changers, increased attention should focus on the quick-change or installation sector of the OMV sector where most used oil and filters will be concentrated.

According to feedback from recycling companies in the southeast region, there are sufficient markets for all three components of used oil filters: the steel shell, paper filter media, and residual used oil. Given the potential environmental threat, the expanding collection infrastructure and the growing demand for recycled steel and used oil, there appears to be sufficient rationale for a statewide ban on disposal of used oil filters in landfills.

RECOMMENDATIONS

The following recommendations are based on the study of generation, recovery, and markets for used oil filters presented in this section.

- The state should promote the use of by-pass filters as a means of maintaining cleaner oil in engines and decreasing the frequency of oil changes. Local governments should be encouraged to provide similar leadership.
- The state should ban disposal of used oil filters. Because of residual oil contained in these filters, the state should not consider the ban on used oil from landfills complete until used oil filters are also banned from disposal.
- In addition to state consideration of a ban on the disposal of filters, local governments should consider implementing local bans on used oil filters.
- The state should support an education campaign to raise awareness of proper filter management methods and to increase the proliferation and visibility of public and private drop-off collection sites.
- State and local governments should seek opportunities to link used oil bottle collection efforts with used oil and oil filter recycling programs.

[1] Filter Manufacturers Council Environmental News. "Estimated Light Duty Oil Filter Sales by State." 1996. p. 4.
[2] NC DPPEA, "Management of Used Oil Filters," 1996. Terne filters are used primarily in buses and large, off road trucks. The plating on terne filers contains lead and is therefore deemed a hazardous material. All non-terne filters are not regulated as hazardous wastes in North Carolina.
[3] Hot draining is defined as a gravity induced process at near-engine-operating temperature and above 60 degrees Fahrenheit
[4] Communications with Brent Hazelett, Filter Manufacturers Council and Bob Boughton, California Environmental Protection Agency Integrated Waste Management Board, September 1998.
[5] U.S. EPA, *Environmental Regulations and Technology, Managing Used Motor Oil*, December 1994, p. 4.
[6] Current estimates reveal that oil filters contain approximately 0.8187 pounds of steel per filter and at least 3.5 ounces of used oil (Filter Manufacturers Council and California Integrated Waste Management Board).
[7] Filter Manufacturers Council Environmental News, "Estimated Light Duty Oil Filter Sales by State," 1996 p. 4.
[8] American Petroleum Institute, *National Used Oil Collection Study*, p. 35, May 1996.
[9] Communications with the Automobile Oil Change Association, October 1998.
[10] After puncturing and hot draining, used oil filters contain roughly 3.5 ounces of used oil. If only hot drained (and not punctured), then used oil filters may contain up to eight ounces of used oil. Based on communications with the Filter Manufacturers Council and Bob Boughton of the California Environmental Protection Agency Integrated Waste Management Board, Communications, August 1998.
[11] Residual used oil figures based on communications with Bob Boughton and the California Environmental Protection Agency Integrated Waste Management Board, Communications, August 1998.
[12] NC DPPEA Fact Sheet, "Eliminating Vehicle Oil Changes and/or Oil Filters Disposal," August 1996.
[13] Assumes 250 uncrushed filters per 55 gallon drum and an average collection fee of $60 per drum.
[14] Estimate from a study by the Filter Manufacturer's Council.
[15] Communications with David Autry, Filtech Filtration Products, October 1998.
[16] Communications with Noble Oil Services and Holston Group Inc., September and October 1998.
[17] Communication with Filtech Filtration Products, October 1998.