Estimating Used Motor Oil Volumes Generated by Do-It-Yourself Oil Changers in Bellevue, Washington

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Since 1993 the City of Bellevue, Washington, has managed a Closed Loop Oil Recycling and Education Program. A central aim of the program is to recover used oil generated by do-it-yourself oil changers. While collection volumes for used oil are accurately estimated, the amount of oil *generated* by do-it-yourselfers—and therefore available for collection—is less well known. The challenge is compounded by the unavailability of sales figures for new oil, and because considerable volumes of oil drip from, or are burned in, car engines. Additionally, estimates of do-it-yourself activity are imperfect, especially with regard to the average number of oil changes per year, and the variable oil capacity of engine crankcases. Finally, some oil volume is disposed along with used oil filters and is not recovered through do-it-yourself channels. This model and report attempt to generate a state-of-the-art methodology for determining available volumes of used do-it-yourself oil in a given jurisdiction. In this case, the City of Bellevue found that 23,642 gallons are being collected annually of an estimated 58,132 available, for a 40.7% collection rate. This rate is considerably higher than most other estimates around the country.

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With a population of 105,700, Bellevue, Washington, is the fourth largest city in the state (Bellevue, 1999). Located just east of Seattle, Bellevue is an important hub of activity in the highly populated area between the Cascade and Olympic Mountains. Currently, Bellevue vehicle owners who do not change their own oil go to fast lube shops, vehicle service shops, or car dealerships, as in most other parts of the country. Persons who opt to change their own oil must dispose of their used oil by bringing it to auto parts stores, car dealerships, or service shops that accept used oil from the public. The only other main option is a twice-per-year visit from the Hazardous Wastemobile, which sets up shop in a parking lot and accepts many different household hazardous wastes, including used oil. However, the county, who sponsors the Wastemobile program, currently encourages folks to dispose of their used oil at private sector sites rather than the Wastemobile.

Since 1993 the City of Bellevue has managed a Closed Loop Oil Recycling and Education Program. The aims of this program are twofold. The first goal is to accomplish greater collection of used motor oil from do-it-yourself (DIY) oil changers, which may be achieved through, for example, greater public education or by instituting curbside recycling programs. Second, this program aims to strengthen the national used oil market by helping to expand the market for re-refined oil; this can be achieved by increasing the use and availability of re-refined oil for fast lube shops, auto dealerships, service stations, and vehicle fleets.

The Used Oil Generation Model presented in this article was constructed to estimate the volume of used oil realistically available for collection from DIY oil changers in the City of Bellevue, and is based on the report, *Good to the Last Drop: Do-It-Yourself Used Motor Oil Generation* (Stitzhal, 1999), available from the lead author. The information from this report provides a benchmark against which to measure the city's success in working toward the Washington State Department of Ecology's goal of 80% used DIY oil recovery (RCW, 1991). In addition, these results will help the City of Bellevue to determine what further steps to take and programs to implement in order to reach these oil recovery goals. It is our hope that other communities interested in analyzing DIY used oil generation may also benefit from studying this report.

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While many jurisdictions have a rough handle on how much used DIY motor oil is actually collected via public and private collection efforts, this only provides the numerator for the fraction used to generate the current recycling rate. To get at the denominator of this fraction, we must determine how much used oil is actually being generated in the first place. The model presented here attempts to determine that denominator by developing, averaging, and surveying a number of different approaches for estimating used oil generation.

Summary of Findings

Using the Used Oil Generation Model laid out in this document, the volume of used oil that is available for collection from DIY oil changers in the City of Bellevue is estimated to be 58,132 gallons (the denominator). The volume of used DIY oil actually collected from Bellevue residents in 1998 is estimated at 23,642 gallons (the numerator). We arrived at these numbers by using the most recent available data for collection volumes. Therefore, the DIY used oil collection rate for the City of Bellevue was 40.7% for the year 1998. Interestingly, according to the American Petroleum Institute (ICF, 1999), the highest national used oil-recycling rate for DIYers, out of a series of models and assumptions, is 27.7%.

King County's Used Oil Collection Estimate

Though the numerator in this fraction is the "easy" number to get at, it is helpful to first corroborate our actual measured collection results with numbers arrived at by another method. King County, the most populated county in Washington State, includes Seattle, its suburbs, and other major cities—such as Bellevue. Using statistics from King County, we derived another estimate of the numerator in our fraction, thus giving us the opportunity to compare it with our estimate of the volume of used DIY oil that was collected in Bellevue.

In 1998 King County collected a total of 364,645 gallons of DIY oil from all the Household Hazardous Waste programs (primarily the Hazardous Wastemobile), and from public and private collection sites (Cole, 1999; King County Department of Natural Resources, 1999). Using either Bellevue's population in proportion to the county's population, or Bellevue's vehicle registrations in proportion to the county's registrations, one would expect Bellevue to collect approximately 23,300 gallons of used DIY oil per year.

This theoretical figure of 23,300 derived from King County statistics is very close to the actual, measured volume of used DIY oil collected in Bellevue. As previously stated and as listed in the *1998 Annual Summary: Do-It-Yourself Used Oil Collection in King County* (King County Department of Natural Resources, 1999), the amount of DIY oil actually collected from Bellevue was reported to be 23,642 gallons.

Background

Model Background

As previously stated, this Used Oil Generation Model was constructed in order to estimate the volume of used oil actually available for collection from DIY oil changers in Bellevue. However, estimating this amount of oil available for collection from DIYers is less straightforward than it may seem. This is due in part to the following five constraints:

- oil sales figures for specific regions are unavailable from the oil industry;
- estimates of the DIY percentage (percentage of persons who change their own oil) are imperfect, especially with regard to the average number of oil changes per DIYer per year, and the degree to which DIYers change their oil every time versus occasionally using fast-lube service;
- engine crankcases have differing oil capacities;
- significant volumes of oil burn in, or drip from, vehicle engines and are therefore unavailable for recovery or straightforward tracking and measurement; and
- some oil volume is disposed along with used oil filters and is also not recoverable through normal DIY collection channels.

This model was developed using different permutations of the above five variables in an attempt to answer the question of how much DIY oil is recoverable in Bellevue. Ultimately, the interpretation and use of the model's results should feed into a larger policy-based decision-making exercise.

Department of Ecology Goal

The Washington State Department of Ecology has developed a working estimate in order to predict the amount of oil that will actually be available for collection via *both* DIY collection sites and fast-lube sites. This metric is 0.9 gallons of used oil generated per person per year (Barrett, 1993). When using the phrase "actually available for collection," it should be noted that this estimate of 0.9 gallons was devel-

oped *after* taking into account burns, drips, and oil left in filters. The previously stated 80% collection goal from the Department of Ecology (RCW, 1991) applies to volumes of used oil that are determined using the 0.9-gallon figure above, that is, the 80% collection goal applies to used oil that is available for recovery, after accounting for burns, drips, and oil left in filters.

Factors Affecting Interpretation of Results

Several key factors may affect the results of the Used Oil Generation Model. Two of the most important factors considered when interpreting the study's findings are noteworthy here, and should be kept in mind when making policy decisions. (An attempt has also been made in the sensitivity analysis, of course, to accommodate some of the variability introduced by these factors.) First, the estimate for the amount of oil in the average vehicle crankcase was determined through a non-scientific series of industry interviews, and may not be accurate.

Second, the estimates used to compose the DIY percentage (the percentage of persons changing their own oil), which are used in each sub-model and the several sensitivity analyses, vary widely. A 1992 King County Metro study determined a 37% DIY percentage (King County Metro Division, 1992); a 1994 Metro study determined a 35% DIY percentage for the county (King County Metro Division, 1994). A 1995 King County Department of Natural Resources Solid Waste Division study (1995) identified a DIY rate of 23%. A 1996 poll of exclusively Bellevue residents, fielded by Elway Research, Inc. (1996) identified a 44% DIY rate. The American Petroleum Institute's used motor oil study (ICF, 1999) uses a national 54% DIY percentage. Based on these figures, and with considerable weight given to the Elway poll of actual Bellevue residents, a DIY percentage of 40% was arbitrarily used for the model.

Model Construction Summary

The Used Oil Generation Model is actually seven models in one. These seven sub-models use different approaches and different assumptions to get at the desired goal, namely, deciphering how much used oil is actually available for collection from DIYers in the city.

After coming up with a result from *each* of the seven sub-models, the results from these seven sub-models are averaged together in order to arrive at overall estimates. This averaging is done in two different ways, as will be described later.

Finally, a sensitivity analysis follows. This analysis assesses to what degree the results of the model vary when certain key variables are increased or decreased. Two different types of sensitivity analysis are included; the first changes only *one* out of four different variables at a time, and the second analysis changes *packages* of variables. Other jurisdictions interested in analyzing DIY used oil generation may benefit from studying these tables and using the variables and/or packages that best fit their own community profile.

The Seven Sub-Models

Several of the sub-models are based on various non-variable background data such as population figures, national and local vehicle registration data, and fuel consumption data. These numbers are used in various ways in the seven sub-models, as may be seen in the following paragraphs (these seven sub-models are also summarized in Table 1). Please note that additional information about assumptions made by the Used Oil Generation Model may be found in the full version of this report (Stitzhal, 1999).

In our first sub-model, Sub-model 1, vehicle registrations in Bellevue were used as a starting point. This sub-model makes assumptions concerning oil changes per year, oil lost to burns and drips, and percentage of persons who change their own oil, that is, the DIY percentage. The model also incorporates an estimate of the oil unavailable for collection due to disposal in used oil filters. Sub-model 1 is one of only two sub-models in this report that does not rely exclusively on macro data from national estimates.

Contrary to the first sub-model, Sub-models 2A and 2B use national estimates from the American Petroleum Institute concerning how much recoverable oil is available in Washington State. Washington State and City of Bellevue *population* figures are used to construct an appropriate ratio for Sub-model 2A, and state and city *vehicle registration* figures are used in Sub-model 2B. The American Petroleum Institute estimates also include adjustments for burning and dripping of oil.

Sub-models 3, 4A, and 4B utilize methods published by the University of Illinois Center for Solid Waste Management in their report *Used Oil Management in Illinois* (Hegberg et al., 1991). Sub-model 3 begins by determining Bellevue fuel sales, which are derived from state figures. US fuel consumption is also determined, using Washington State fuel

Table 1. Summary of sub-models

Sub-model number	Key characteristics	Notes
Sub-model 1	Builds off of Bellevue vehicle registrations	Makes assumptions regarding oil changes per year, oil lost to burns and drips, and percentage of persons who change their own oil. Does not rely largely on macro data from national estimates.
Sub-model 2A	Builds off of national data and local and state population figures	Uses national estimates from American Petroleum Institute.
Sub-model 2B	Builds off of national data and local and state vehicle registrations	Uses national estimates from American Petroleum Institute.
Sub-model 3	Builds off of state fuel sales	Utilizes methods published by the University of Illinois Center for Waste Management. Adjusts for the DIY rate and oil lost to drips and burns.
Sub-model 4A	Builds off of US oil sales and state and local vehicle registration figures	Utilizes methods published by the University of Illinois Center for Waste Management. Adjusts for the DIY rate and oil lost to drips and burns.
Sub-model 4B	Builds off of US oil sales and state and local population figures	Utilizes methods published by the University of Illinois Center for Waste Management. Adjusts for the DIY rate and oil lost to drips and burns.
Sub-model 5	Builds off oil filter sales	Does not rely exclusively on macro data from national estimates.

sales figures. The Bellevue and US fuel sales estimates are then used, in conjunction with US oil sales estimates from the American Petroleum Institute, to determine Bellevue oil sales. Finally, Bellevue oil sales are adjusted to take into account the DIY percentage, and the oil lost to drips and burns.

In a similar manner, Sub-model 4A utilizes US oil sales and state and local *vehicle registration* figures, then adjusts for the DIY rate and oil lost to drips and burns. Subsequently, Sub-model 4B utilizes US oil sales and state and local *population* figures, and then also adjusts for the DIY percentage and oil lost to drips and burns.

The final model, Sub-model 5, is the second of the two sub-models that does not rely exclusively on macro data. Sub-model 5 takes the unique angle of estimating the amount of DIY oil generated in Bellevue by looking at oil *filter sales* figures for the city (DIY filter sales data are derived from figures presented in ICF Incorporated, 1999). Sub-models 1 and 5 rely the least on aggregated national data, and are the ones favored by the City of Bellevue staff.

Averaging the Sub-Models

During this next step, we first averaged the results of all seven sub-models, in order to produce an overall estimate. The second type of averaging pulls out only specific sub-models to be averaged together. In this latter case, for instance, Sub-models 1 and 5 were averaged together because they are the only two models that do not rely exclusively on macro data from national estimates; as previously noted, these two models are favored by the City of Bellevue. In a similar fashion, all five sub-models contained in Sub-models 2 through 4 were averaged together; the reason for this was because they *do* rely largely on macro data.

Table 2 presents Bellevue's annual volume of used DIY oil available for recovery per year based on the seven different generation sub-models. Dividing these generation figures by Bellevue's population generates a per capita generation rate. This simple metric may be used by other jurisdictions (depending on which sub-model they feel best fits their population).

The volumes generated by the different sub-models range from a high of 102,326 gallons using Sub-model 2B, to a low of 44,106 gallons using Sub-model 5. The respective per capita generation figures are a high of 0.97 gallons per person per year for Sub-model 2B and a low of 0.42 gallons for Sub-model 5. Table 2 also shows that the average across all sub-models is 74,021 gallons per year, or 0.70 gallons per person per year. Averages are also given for Sub-models 1 plus 5 and Sub-models 2 through 4.

Sensitivity Analysis

In the sensitivity analysis, only the average from all seven sub-models, and the average of Sub-models 1 and 5, are used. The first sensitivity analysis changes one of four different key variables at a time, holding the other three steady (Table 3). The Original Value column represents our base model, that is, the profile of Bellevue DIYers that came about as a result of this study. A second, alternate value is provided for each of Key Variables 1 through 4. This results, of course, in an alternate average for each variable; these may be higher or lower than the original average.

The second sensitivity analysis changes *packages* of variables; three such packages of changed variables are presented. For example, as shown in Table 4, values are portrayed that assume a maximum generation of used oil; these combined values are averaged for all seven sub-models and also for Sub-models 1 and 5 only, and the results are summarized in Table 5. In a similar fashion, Table 6 sets forth values that make the assumption of a minimal generation of used oil, revealing the results in Table 7. The third package (Table 8) subjectively approximates the conditions of a younger, newer vehicle population, such as might be found in Bellevue. Here an assumption is made regarding the DIY rate; that is, owners of newer vehicles bring them in more frequently to dealerships, and so on while still under warranty. The results are given in Table 9.

Table 2. Bellevue annual and per capita volumes of recoverable DIY oil for each sub-model in DIY study (1999)

Sub-model number	Total DIY oil generation (gallons/year)	Per capita generation (gallons/year)
Sub-model 2B	102,326	0.97
Sub-model 2A	101,415	0.96
Sub-model 1	72,158	0.68
Sub-model 4A	68,336	0.65
Sub-model 3	64,902	0.61
Sub-model 4B	64,902	0.61
Sub-model 5	44,106	0.42
Average, all sub-models	74,021	0.70
Average, Sub-models 1 and 5	58,132	0.55
Average, Sub-models 2 through 4	80,376	0.76

Used Oil Generation Estimates Totaling DIY and Installer Volumes

Another interesting way to get at the used oil generated in Bellevue may be to compare current collection figures to broad estimates of how much *total* oil should be generated in Bellevue on an annual basis, regardless of a distinction between DIY or fast lube service. Though this is more of a "back-door" method, it gives us another set of results to compare with our estimate of Bellevue's DIY used oil collection rate. Two methods for determining this macro volume figure are available (Stitzhal, 1999) and represent how much total oil should be flowing through the various used oil channels of the city.

Table 3. Sensitivity analysis for single-variable changes in DIY study (1999)

Key variable	Value used		Average oil available, all models (gal./yr.)		Average oil available models 1 & 5 (gal./yr.)	
	Original value	Alternate value	Original average	Alternate average	Original average	Alternate average
1. Oil changes per year	3	4	74,021	77,935	58,132	71,833
2. Percent oil lost	35	30	74,021	77,697	58,132	63,377
3a. DIY percent I	40	30	74,021	62,792	58,132	43,599
3b. DIY percent II	40	54	74,021	89,741	58,132	78,479
4. Quarts per full crankcase	5	4.5	74,021	72,073	58,132	51,314

Table 4. Values used for sensitivity analysis in DIY study (1999): packaged-variable change assuming maximization of used oil generation ("high oil")

	Value used	
Key variable	**Original value**	**Alternate value**
Oil changes per year	3	4
Percent oil lost	35	25
DIY percent	40	54
Quarts per full crankcase	5	5.5

Table 5. Results of sensitivity analysis based on values in Table 4

Average oil available, all models (gal./yr.)		**Average oil available, models 1 & 5 (gal./yr.)**	
Original average	**Alternate average**	**Original average**	**Alternate average**
74,021	109,408	58,132	126,735

Table 6. Values used for sensitivity analysis in DIY study (1999): packaged-variable change assuming minimization of used oil generation ("low oil")

	Value used	
Key variables	**Original value**	**Alternate value**
Oil changes per year	3	2
Percent oil lost	35	40
DIY percent	40	30

Table 7. Results of sensitivity analysis based on values in Table 6

Average oil available, all models (gal./yr.)		**Average oil available, models 1 & 5 (gal./yr.)**	
Original average	**Alternate average**	**Original average**	**Alternate average**
74,021	58,223	58,132	33,323

Table 8. Values used for sensitivity analysis in DIY study (1999): packaged-variable change assuming a young vehicle population

	Value used	
Key variables	**Original value**	**Alternate value**
Oil changes per year	3	4
Percent oil lost	35	15
DIY percent	40	20

Table 9. Results of sensitivity analysis based on values in Table 8

Average oil available, all models (gal./yr.)		**Average oil available, models 1 & 5 (gal./yr.)**	
Original average	**Alternate average**	**Original average**	**Alternate average**
74,021	57,875	58,132	35,917

Method One uses a 1997 assumption from the American Petroleum Institute (ICF, 1999) estimating that persons residing in Washington State use 3.1 gallons of oil per person per year. Using Bellevue's population, this gives a yield of 327,670 gallons of passenger car motor oil used annually in the city (again, this includes both DIY and installer-serviced vehicles).

Method Two, which is adapted from a City of Seattle oil estimation model found in *A Guidebook for Implementing Curbside and Drop-off Used Motor Oil Collections Programs* (Stitzel, 1992), makes assumptions about how many households own how many cars, and how many gallons of oil are generated per car per year (3.5 gallons). Using Bellevue's population, this method gives us a yield of 332,955 gallons of passenger car motor oil in Bellevue used annually (including both DIY and installer-serviced vehicles). Averaging the results from the above two methods, we arrive at a figure of 330,313 gallons used annually in Bellevue.

Meanwhile, in 1997, the City of Bellevue's project staff attempted to estimate the volume of used motor oil collected via fast-lube service providers. Using the information collected from 71 reporting fast-lube sites (out of 92) in the city (as per Van Duyne, 1995), this estimate came out to 399,344 gallons per year collected for all fast-lube sites in the Bellevue area. Combining these 399,344 gallons with the county's 1998 estimate of DIY oil (23,642), Bellevue's total used oil per year comes out to 422,986 gallons.

Comparing this macro data with the non-macro data, we see that Bellevue's total used oil collection rate is 128% (422,986/330,313). Two interpretations are possible. There are either disproportionately many people bringing their cars to fast lubes and/or dealerships in Bellevue even though they do *not* live in Bellevue, or there are problems with the methodology. Interestingly, from the fast lube patron survey done for Bellevue in 1995, it was estimated that 50% of customers interviewed in fast lube shops said they do *not* live in Bellevue. This corroborates the non-resident oil change interpretation of the collection rate being well over 100%.

This finding makes it extremely difficult to estimate how much of the 422,986 gallons actually collected in Bellevue to attribute to the theoretical 330,313 gallons estimated to be generated in the city. It further suggests that the fast lube data is not useful for estimating the amount of oil generated by Bellevue residents.

An interesting side point regarding stability of the DIY rate: overall, fast-lube site respondents indicated that they have not seen a marked increase in their volume of fast lube customers; 24 reported an increase, 26 reported no increase, 6 reported uncertainty (Van Duyne, 1995).

Preferred Estimated DIY Rate for Bellevue

Let us assume that the King County estimate of used DIY oil collected in Bellevue for 1998, our numerator (see Summary of Findings section) is accurate at 23,642 gallons. Let us further assume that the most accurate estimate of used DIY oil generated in Bellevue, given the non-reliance on macro data, is determined by averaging Sub-models 1 and 5. Combined, these assumptions result in a citywide annual generation of 58,132 gallons of used oil. It further follows that Bellevue's DIY used oil collection rate is 40.7% (23,642/58,132).

What Happened to the Missing Oil?

The ways in which used oil is disposed of, if not by the proper collection methods, may give a jurisdiction valuable information for dealing with the problem. As seen above, 34,490 gallons of used DIY motor oil are not accounted for (subtract 23,642 from 58,132). Of these missing 34,490 gallons, estimates indicate that oil thrown in the trash can possibly account for a little over 5,000 gallons, as outlined in the following sub-section. The remaining oil may be improperly disposed of in storm sewers, parking lots, the ground, and so on. DIYers may also bring a small portion of this remaining oil to informal collection sites such as neighborhood gas stations and shop heaters; this oil may not be figured into the county estimate.

Estimation of DIY Oil Disposed of in Bellevue Trash

A major issue of concern in measuring DIY oil is the volume of oil disposed of in municipal trash. In 1994/1995 a Seattle residential waste sort determined that used motor oil made up approximately 0.017%, by weight, of the total waste stream (Anderson, 1996; Johansson, 1996). It is important to bear in mind that this is calculated for oil that *remained* in containers that were placed in the trash. It is speculated that a large percentage of containers holding used oil burst in the trash when compacted, before even being weighed. Some experts indicate that the burst volume could be four to five times higher than the volumes of oil that remain in containers. Thus, this 0.017% figure greatly underestimates the amount of oil disposed of in the residential trash stream. Also of significance is the fact that the above weight figures for oil include the weight of the container, thus slightly overestimating the amount of oil in the waste stream.

Using the original figures from the 1994/1995 Seattle residential waste sort, and assuming that Bellevue has approximately one-fifth the population of Seattle, Bellevue places 5 tons, or 10,000 pounds, of used oil in the trash annually. Using a weight of 7.8 pounds per gallon of oil, there are approximately 1,300 gallons of used DIY oil disposed of in Bellevue annually. If we then arbitrarily multiply by a factor of four to account for burst containers, there are approximately 5,200 gallons of used DIY oil disposed of in Bellevue's trash annually.

Analysis of DIY Rate Derived from Used Oil Generation Model

As already stated, the preferred estimate of Bellevue's DIY used oil collection rate is 40.7% (23,642/58,132), using the average of Sub-models 1 and 5. Interestingly, the Northern Virginia Planning District Commission (1999) recently issued their *Virginia Used Oil, Filter, and Antifreeze Consumer Management Study.* A useful rule-of-thumb presented by the project lead states that for every oil filter changed, one gallon of used oil is generated (this estimate accounts for oil left in the filter and burned or dripped from the engine). This particular technique would result in 59,986 gallons of DIY used oil generated per year in Bellevue. That is remarkably close to the 58,132-gallon generation estimate used in this report.

Please note that if only Sub-model 5 of the Used Oil Generation Model is used to estimate oil generation, the collection rate is 53.6% for 1998. As we have seen, Sub-model 5 is based upon oil filter sales figures in Bellevue, and the one most preferred by the City of Bellevue staff.

If the average oil generation rate across all sub-models is used, the city's collection rate is 32%. If the average of Sub-models 2 through 4 is used, the collection rate is 29%. By

comparison, King County's overall collection rate for 1996 was 26%, although this was derived using a different methodology (King County Department of Natural Resources, 1997).

Conclusions and Recommendations

The results from the generation rate methodologies above indicate that the City of Bellevue must collect additional volumes of used DIY oil if the 80% collection goal is to be met. As Bellevue oil collection activities continue in the future, two efforts should be emphasized. First, the tracking of volumes of collected used oil should continue, perhaps in even greater detail than in years past (e.g., DIY oil may be going to car dealers, unidentified service stations, and other Bellevue collection points that are not being measured by government surveys). This collection volume figure will give a sense of how much oil is actually collected, regardless of the firmness of the generation figure against which it is compared. Second, efforts should be made to increase the volumes of oil actually collected.

Several steps may be taken to attempt to identify the source and size of the discrepancy between generation estimates and collection estimates, while at the same time collecting increasing amounts of used DIY oil in Bellevue:

- Continue and expand public education efforts to encourage DIY used oil recycling. For example, the City of Bellevue has developed stickers that they give to individual stores that sell oil. The stickers encourage buyers to bring their used oil back to the store from which they purchased it, and room is provided on the sticker for the store to stamp its name, logo, and address. Using case stickers, radio advertising, in-store signage, and other means to encourage oil recycling behavior may result in increased volumes of collected oil. If this is the case, then we can be a little more certain that the gap between the generation and collection estimates is made up at least in part by used oil that was not previously being captured. If efforts to increase collection volumes do not result in increased volumes being collected, either the generation methodology or the outreach efforts will be called into question.
- Continue using polls and other research to measure a specific DIY rate for the City of Bellevue. This factor has a huge impact on oil generation estimates.
- It may prove useful to implement a pilot curbside used oil collection program. Such programs typically boost used oil collection volumes. As above, if volumes increase we can be more certain that the gap between the generation and collection estimates is made up at least in part by used oil that was not previously being captured.
- Another approach to boosting used oil collection rates is to increase the role played by the manufacturers and retailers responsible for bringing the product to market. So-called "producer responsibility" is far more common in Europe, Canada, and Asia, and could prove useful in the US. This policy mechanism serves to incorporate the costs of proper environmental management into the cost of the product. Thus oil consumers help pay for collection rather than spreading the collection and remediation costs over an entire population or tax base.

  In British Columbia, for example, anyone selling oil must serve as a collection site (or contract with someone within four kilometers of that location). Oil retailers must use licensed haulers, advertise the fact that they accept used oil, and meet specified container and spill requirements. In Alberta, a private, non-profit association operates an industry-based collection program funded by a fee on virgin oil. California also has a deposit system on used oil.
- Some countries have stricter regulatory frameworks surrounding DIY activity, making changing one's own oil a rarity. This serves to direct the majority of used oil toward service stations and car dealerships, thereby increasing the likelihood of proper management.
- Market development efforts for re-refined motor oil can also serve to convey the message that recycling used oil is a necessary step in closing the loop on oil management. While such efforts would not necessarily help identify why there is a current gap between generation and collection estimates, it could serve to support an increase in used oil collection.

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