

DISHWASHER SURVEY REPORT

Submitted to:

**The Northwest Energy Efficiency Alliance
and
The Consortium for Energy Efficiency**

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DISHWASHER SURVEY REPORT

EXECUTIVE SUMMARY

Research Goals and Methodology

The purpose of this research, sponsored by the Northwest Energy Efficiency Alliance and the Consortium for Energy Efficiency, was to gather better information about how households use their dishwashers. The results of this study will address several issues currently under discussion with the U.S. Department of Energy and the Association of Home Appliance Manufacturers about the test procedures used to determine dishwasher energy and water efficiency. These issues include:

- Whether the test's specification for using clean dishes is appropriate, especially for "soil sensor" machines that adjust water and energy use depending upon the amount of food left on the dishes;
- The average number of times households run their dishwashers each year.

To address these issues, the research sponsors hired Dethman & Associates (a market research and evaluation firm in Seattle, Washington) to work with them to design and conduct survey research to assess:

- 1) How people pre-treat their dishes and how clean their dishes are before the dishwasher is run;
- 2) How dishwashers perform in terms of their cleaning ability and how satisfied consumers are with their dishwashers;
- 3) How often people run their dishwashers;
- 4) Whether findings about pre-treatment, dish cleanliness, cleaning ability, satisfaction, and number of times running the machine vary significantly by soil sensor versus non-soil sensor machines, respondents' level of environmental awareness, and various demographic variables (e.g., household size).

Telephone interviews were conducted in February 1999 with 227 (out of 623) Oregon households who had recently purchased energy efficient dishwashers and who had applied to the Oregon Office of Energy (OOE) for a tax credit. This population was used to cost-effectively reach an adequate number of households with soil sensing dishwashers, which are relatively new on the market. This sample size reliably represents households with newer, more efficient dishwashers, with plus or minus 7% error in 95 samples out of 100.

However, care should be taken when projecting the results of this research to the larger population of all dishwasher users, which would have a wider variety of machines in terms of age, make, effectiveness, and efficiency and whose users may also differ in terms of demographics and/or attitudes. To determine whether the households in this study differ from a sample of all dishwasher users would require that similar data be gathered from a broader sample.

Key Findings

Information About Respondents and Their Environmental Attitudes

- The average household size was 2.85 people. Household size among respondents ranged from 1 to 8 people.
- Most people (86%) have lived in the Northwest for 9 years or more.
- About half of respondents (56%) had a college degree or more, while 30% had some college, and 21% had a high school education (or less).
- While almost a third of respondents (29%) would not disclose their annual income level, 25% reported incomes above \$75,000; 20% had incomes between \$50,000 and \$75,000; 22% had incomes between \$25,000 and \$50,000; and 4% had incomes of under \$25,000 per year.
- When a scale was constructed from answers to several questions about “green” behaviors such as recycling, saving energy and water, and buying environmentally safe products, over half (57%) of respondents scored as “very environmental.” Another 36% scored as “somewhat environmental” on this composite scale.
- Similarly, when asked to rate themselves on their involvement in taking steps to save the environment, 85% said they were very or somewhat involved.
- However, how households scored on environmental involvement **did not prove** to be a significant factor in predicting differences in dishwasher behavior.

Dishwasher Type and Operation

- One third (33%) of machines have soil sensors, while 67% do not.
- On average, people run their dishwashers 5.38 times per week, or approximately 280 times per year.
- The relationship between the frequency of running a dishwasher and household size is strong. Dishwashers are run an average of 4.58 times per week in households of 1-2 people, while in households of 5 or more they are run an average of 7.38 times per week. Thus the range is from 238 to 384 times per year.

Pre-treating Dishes Before Loading

Since the amount of food left on dishes before the dishwasher is operated is likely to affect the amount of energy and water that a soil sensor machine uses to clean the dishes, it was important to help respondents accurately assess how clean their dishes were before they turned on their machines. Thus, we asked respondents to describe how they pre-treat their dishes before loading. Key findings about pre-treatment include:

- Pre-treatment is complex, and behaviors likely depend on what food has been on the dishes, what types of dishes or pans are being loaded, and other factors.
- Most loads are made up of dishes that have been pre-treated in a variety of ways. Data from this sample shows that a typical load is pre-treated as follows:

- ✓ 42% of a typical load is treated by using water (e.g., rinsing and soaking)
 - ✓ 27% of the load is pre-treated with a combination of wet and dry techniques
 - ✓ 23% of the load is treated without using water, such as by scraping
 - ✓ 8% of the load receives no pre-treatment.
- Notably, people with soil sensor dishwashers tend to pre-treat their dishes less than people without soil sensor dishwashers. For instance:
 - ✓ Respondents with soil sensor dishwashers do not pre-treat 13% of a typical load, while respondents without soil sensor dishwashers do not pre-treat 5% of a typical load.
 - ✓ Respondents without soil sensor dishwashers pre-treat more thoroughly (both scraping and water) on 31% of the load while those with soil sensors do such thorough pre-treatment on only 18% of the load.

Ratings of Dish Cleanliness Before Washing

To more directly measure the cleanliness of dishes before a dishwasher is run, we also asked respondents to describe what portion of a typical load of dishes fits into each of the categories below, before the dishwasher was turned on:

- Very clean, with all or almost all of the food particles gone or invisible
- Somewhat clean, with some small bits of food and sauce visible
- Somewhat dirty, with only the biggest pieces of food removed
- Very dirty, with no or almost no food removed.

We then developed a weighted average based on these percentages to characterize the overall cleanliness of a respondent's typical load. (Note: These figures are based on % of respondents, not % of a load.) According to these calculations:

- Just under half of respondents (45%) run loads that are primarily very clean (food is gone or invisible).
- Another 38% run loads that are somewhat clean (small bits of food remain).
- 17% run loads that are somewhat (14%) or very (3%) dirty.

Finally, when respondents were asked to choose *one description* of how clean their load looked overall before the machine was turned on, they described their loads as more dirty than the weighted average scores.

- 25% of respondents said their average loads, overall, were very clean.
- Another 38% described their average loads as somewhat clean.
- Over a third (37%) rated their average loads as very or somewhat dirty.

Regardless of which measure of cleanliness was used (i.e., the weighted average or the respondent's single self-assessment), comparisons of dish cleanliness between soil

sensor and non-soil sensor machines were consistent with the pre-treatment data. Using respondents' self-assessment of overall cleanliness, the data reveal that:

- Soil sensor dishwashers have significantly more dirty dishes in them prior to running than do machines without soil sensors, with 52% of respondents with soil-sensor machines rating their pre-wash loads as very or somewhat clean, compared to 68% of respondents with non-soil sensor machines.

Dishwasher Performance and Respondent Satisfaction

- Spotting and food particles are generally not a problem for most respondents: 87% said spotting occurs not too often or not at all often and 88% said food particles are left on dishes not too often or not at all often.
- Spotting and food particles are more of a problem for larger households. While only 13% of respondents overall report that spotting occurs very or somewhat often, 28% of respondents in households of five people or more report this problem.
- Respondents report they are quite satisfied with their dishwashers. 83% are very satisfied and another 12% are somewhat satisfied. Respondents are satisfied primarily because the dishwashers get the dishes clean, they're quiet, and they're water and energy efficient.
- Satisfaction levels are significantly lower among individuals from households of five or more.
- Spotting, food particles, and overall satisfaction do not vary significantly by the presence or absence of a soil sensor in the machine.

Conclusions

Dish cleanliness

In most households respondents do not consider their dishes as "very clean" before the dishwasher is run. In addition, the amount of dirty dishes in a typical load is significantly more for soil sensor machines than for non-soil sensors according to respondents' self-assessments. Very clean dishes never make up more than about one quarter of the load, for all machines, soil sensor or non-soil sensor.

Pre-treatment of dishes

Pre-treatment is complex. Almost everybody pre-treats, at least a little bit. Only 2% of respondents do not pre-treat at all. Most people use more than one pre-treatment technique (scraping, rinsing, scraping and rinsing, and doing nothing) to prepare their load. Some pre-treat most of the dishes, others pre-treat a small portion. People with soil sensors do less pre-treatment than those without, supporting the finding that dishes are generally dirtier in soil sensor machines before the machine is run.

Satisfaction with dishwashers

People are generally satisfied with their dishwashers. Household size does affect dishwasher performance and satisfaction, with larger households having more problems and complaints. While soil sensors affect pre-treatment and dish cleanliness, they do not significantly affect dishwasher performance or consumer satisfaction.

Environmental involvement and its effect upon dishwasher use and attitudes

The level of environmental involvement, as measured in this study, among these respondents, did not predict any significant differences in dishwasher use and attitudes.

INTRODUCTION AND METHODOLOGY

Background and Research Goals

The purpose of this study, sponsored by the Northwest Energy Efficiency Alliance and the Consortium for Energy Efficiency, was to gather better information about how households use their dishwashers. The results of this study will address several issues currently under discussion with the U.S. Department of Energy and the Association of Home Appliance Manufacturers about the test procedures used to determine dishwasher energy and water efficiency. These issues include:

- Whether the part of the test that calls for clean dishes to be used is appropriate, especially for new “soil sensor” dishwashers that adjust the amount of water and energy used depending upon the amount of food left on the dishes;
- The average number of times households run their dishwashers each year.

To address these issues, the research sponsors hired Dethman & Associates, a market research and evaluation firm in Seattle, Washington, to undertake survey research to assess:

- 1) How people pre-treat their dishes and how clean their dishes are before the dishwasher is run;
- 2) How dishwashers perform in terms of their cleaning ability and how satisfied consumers are with their dishwashers;
- 3) How often people run their dishwashers;
- 4) Whether findings about pre-treatment, dish cleanliness, cleaning ability, satisfaction, and number of times running the machine vary significantly by soil sensor versus non-soil sensor machines, respondents’ level of environmental awareness, and various demographic variables (e.g., household size).

An additional research issue, when the project began, was to determine whether or not pre-treatment activities, dish cleanliness, respondent satisfaction with the machine, and machine cleaning performance varied with dishwasher energy efficiency. While still a pertinent issue, this research could not address it since all the dishwashers in this study are currently considered energy efficient. The research sponsors may, in the future, conduct further research to address this question.

Methodology

Sample Selection and Size

The Oregon Office of Energy (OOE) provided a database of 623 households in Oregon who had purchased efficient dishwashers that qualified for an Oregon State tax credit within the past year. Based upon further information from OOE, we coded if the household had purchased a dishwasher with or without a soil sensing device. Please note that this population was used to cost-effectively reach an adequate number of households with soil sensing dishwashers, which are relatively new on the market.

Market Data Research Corporation, a survey fielding firm in Tacoma, Washington, administered a telephone survey during the first half of February 1999. Interviews were

done on weekday evenings (between 5 and 9pm) and on Saturdays during the daytime (10am to 6pm). Unless otherwise extinguished, each household was called multiple times in an attempt to gain the most completes possible from this list. Market Data used a computer-assisted telephone interviewing system (CATI), in which responses are immediately coded into a computer while the interviewer is talking to the respondent. The average survey length was 8.36 minutes. A copy of the survey is attached in Appendix A.

In all, 227 interviews were completed, representing 36% of the households in the database. This sample size reliably represents households with newer, more efficient dishwashers, with plus or minus 7% error in 95 samples out of 100.

However, care should be taken when projecting the results of this research to the larger population of all dishwasher users, which would have a wider variety of machines in terms of age, make, effectiveness, and efficiency and whose users may also differ in terms of demographics and/or attitudes. To determine whether the households in this study differ from a sample of all dishwasher users would require that similar data be gathered from a broader sample.

Data Analysis

Under instruction from Dethman & Associates, Market Data performed the frequency and cross-tabulation analysis using Survey System, a statistical software package. Some frequencies are re-coded into fewer categories for the tables in the body of the report. More detailed frequency runs are presented in Appendix B and on an electronic data file. Please note that due to rounding, percentages may not always equal 100%.

Cross-tabulations were performed on all relevant questions to look for significant differences by sensor/non-sensor dishwashers, level of environmental awareness, and demographic characteristics. A Chi-Square statistic was run for each cross-tabulation to determine statistically significant differences (which means there is less than a 5% chance that this difference occurred by chance). The body of the report includes only those cross-tabulations that show significant differences relevant to the goals of this study. Note that wherever findings are described as “significantly different” in the text, this means that they are statistically significant. All cross-tabulations (significant and non-significant) are provided in Appendix B and are also available on an electronic file.

KEY FINDINGS

Description of Respondents and Their Dishwashers

Who is speaking in this report?

As described in the Methodology section, this is not a random sample of the entire population of dishwasher users. These respondents have all recently purchased new, efficient dishwashers, and their demographics may or may not differ from a sample of all dishwasher users. The following tables show the respondents' household size, length of residence in the Northwest, education, and income. More detailed frequencies about some of the demographics are shown in Appendix B.

A screening question at the beginning of the survey asked the potential respondent if he or she was the person in the household who “most often prepares the dishes for loading the dishwasher.” Nearly all of the respondents (93%) who completed the survey were the person in the household who most often loaded the dishwasher. The other 7% (to whom we spoke when the primary dishwasher was not available) were people who knew how dishes were prepared for loading the household’s dishwasher even though they were not the primary person.

The average household size for the sample was 2.85 people, with a range of 1 to 8 people (see Appendix B). As shown on Table 1, just over half (54%) were from small households of one or two, while 13% of respondents were from households with five or more individuals.

Table 1 – Household Size (including adults and children) (Q38)

Household Size	Number	Percentage
1-2 individuals	123	54%
3-4 individuals	74	33%
5 or more individuals	29	13%
Don't Know/Refused	1	0%
	<i>N=227</i>	

Respondents were asked how long they had lived in the Northwest, usually Oregon, Washington, Idaho, Alaska, and Montana. Most respondents have been in the Northwest for a long time, with 86% reporting that they have been here for nine years or more (Table 2).

Table 2 – Length of Time Respondent Has Lived in Northwest (Q39)

Length of Time	Number	Percentage
Less than 9 years	29	13%
9 or more years	196	86%
Don't Know/Refused	2	1%
	<i>N=227</i>	

Tables 3 and 4 show education and income levels. Nearly half of respondents (45%) have college or graduate degrees, with another 30% with some college or technical school. Household incomes were spread fairly evenly across the three middle categories, with smaller percentages earning less than \$25,000 per year and over \$100,000 per year. However, almost a third of households declined to give their income level; typically those who decline have higher incomes, which indicates this population probably has a higher average income level than shown here.

Table 3 – Educational Level (Q40)

Educational Level	Number	Percentage
Graduate school	28	12%
College degree	75	33%
Some college or a technical school	67	30%
High school or less	47	21%
Don't Know/Refused	10	4%
	<i>N=227</i>	

Table 4 – Total Household Income for 1998 (Q41)

Income	Number	Percentage
Under \$25,000	10	4%
\$25,000 - \$50,000	49	22%
\$50,000 - \$75,000	45	20%
\$75,000 - \$100,000	36	16%
\$100,000 or more	21	9%
Don't Know/Refused	66	29%
	<i>N=227</i>	

Types of dishwashers represented in the report

All dishwashers in the households on the list qualified for an Oregon State efficiency tax credit. A variety of brands and model numbers are represented. Machines with soil sensors include Maytag and some Bosch models. Machines without soil sensors include Frigidaire, Gibson, Asko, and some Bosch models. As shown in Table 5, 33% of machines had soil sensors while 67% did not.

Table 5 – Soil-sensor vs. Non Soil-Sensor Machines

Machine type	Number	Percentage
Soil-sensors	74	33%
Non soil-sensors	153	67%
	<i>N=227</i>	

How often dishwashers are run

Respondents were asked how many times per week they usually run their dishwashers. On average, dishwashers are run 5.38 times per week, which equals approximately 280 times per year. Table 6 shows the distribution of times per week. More detailed frequencies are in Appendix B.

Table 6 – Times Per Week Dishwasher is Run (Q9)

How often	Number	Percentage
1-3 times per week	56	25%
4-6 times per week	84	37%
7-15 times per week	87	38%
N=227		
Note: Average use equals 5.38 times per week or 280 times per year		

As shown in Table 7 below, frequency of running a dishwasher is strongly related to household size. A dishwasher is run an average of 4.58 times per week in a household of 1-2 people, while it is run an average of 7.38 times/week in a household of 5 or more. The average number of times per year thus also varies from 238 to 384. A detailed cross-tabulation showing frequency of running the machine by household size is in Appendix B.

Table 7 – How Often Dishwasher is Run (Q9) by Household Size

	Total	Household Size					
		1-2	Times/ Yr	3-4	Times/ Yr	5 or more	Times/ Yr
Average times per week	5.38	4.58	238	5.97	310	7.38	384
N=	227	123		74		29	

Respondents’ attitudes toward the environment

We asked respondents specific questions about “environmentally friendly” or “green” behaviors, and a broader question about their involvement in saving the environment. The behavior questions included a series of statements that are listed below. For each statement, the respondent was asked if it described them very well, somewhat, a little, or not at all. The statements addressed the following activities:

- Buying recycled products
- Recycling or reusing household waste including paper, cans and bottles
- Choosing energy-efficient products over less efficient ones
- Making their home energy-efficient
- Choosing water saving products over products that use more water
- Making their home water-efficient
- Choosing environmentally safe household and gardening products.

The detailed frequencies of responses to each of these statements are in Appendix B. However, to simplify these results for use in cross-tabulations, we developed an overall “environmental awareness” score for each respondent. The score adds together the results for each of the seven statements, so that, for instance, individuals who said that most of the statements described them “very well” are scored as very environmental. If, on the other hand, respondents reported that the statements didn’t describe them well,

they were scored as not environmental. The mathematical equation used to develop the score is in Appendix C.

Table 8 shows how respondents scored on this composite scale. While self-reporting about environmental behavior can be prone to a positive bias since it is socially acceptable to pay attention to the environment, this group clearly is very interested in taking steps to save water and energy, to use recycled products, and so on. Over half (57%) received a score of very environmental, and nearly all (93%) scored as either very or somewhat environmental in terms of specific steps they take in their daily lives.

Table 8 – Score For Environmental Behaviors (based on Q29-36)

Behavior	Number	Percentage
Very environmental	129	57%
Somewhat environmental	82	36%
A little environmental	14	6%
Not at all environmental	2	1%
	<i>N=227</i>	

Respondents were then asked “Overall, would you describe yourself as someone who is very involved in taking steps that save the environment, somewhat involved in taking steps that save the environment, not too involved in taking steps that save the environment, or not at all involved in taking steps that save the environment?” As shown in Table 9, a large group (85%) report they are very or somewhat involved. However, a much smaller percentage of respondents reports they are very involved in saving the environment than the percentage that scored as very environmental on the composite scale (29% versus 57%). Perhaps this is because individuals may not equate taking a number of smaller environmental steps (e.g., buying recycled products) to being “very involved in saving the environment.”

Table 9 – Involvement in Taking Steps That Save the Environment (Q37)

Level of Involvement	Number	Percentage
Very involved	65	29%
Somewhat involved	128	56%
Not too involved	28	12%
Not at all involved	3	1%
Don't Know/Refused	3	1%
	<i>N=227</i>	

Cross-tabulations were run to see how the level of environmental awareness was affected by the presence or lack of a soil sensor and by demographic characteristics. Other cross-tabulations examined whether dish cleanliness and machine satisfaction were significantly affected by a respondent's level of environmental awareness. As detailed in Appendix B, environmental awareness was not found to be a significant factor in predicting behavior in this study. Whether it would be a factor in a random sample of the general population of dishwasher users still needs to be determined.

Pre-Treatment and Cleanliness of Dishes

The amount of food left on dishes before the dishwasher is operated likely affects the amount of energy and water that a soil sensor machine uses. Therefore, a central goal of this survey research was to find out how clean dishes are before the dishwasher is run.

We asked a series of questions to help respondents accurately assess how clean their dishes are before they turn on the machine. The first questions addressed what people do to pre-treat their dishes before they load them; the next questions asked specifically how clean the dishes looked before the machine was turned on. Findings are discussed below in terms of pre-treatment activities and dish cleanliness; significant affects by soil sensor/non-soil sensor machines and other variables are also presented.

Pre-treatment of dishes

Respondents were asked to think about an average load of dishes – including plates, silverware, glassware, pots and pans – that they had prepared to put in the dishwasher. They were then asked what percent of that average load would be pre-treated in each of the following ways:

- Removing food **without using water**, such as by scraping food into the sink
- Removing food **using water**, such as by rinsing, washing, or soaking
- Removing food through a **combination** of scraping (without water) and rinsing or soaking (using water)
- Loading the dishes without scraping or rinsing (i.e., **no pre-treatment** at all)

We chose to ask the question in this way rather than a simple yes/no question (e.g., do you/do you not pre-treat with water) to describe in more detail the pre-treatment that an average load of dishes receives. The data presented here and in the appendices show that pre-treatment is fairly complex, with a lot of variation in techniques used and how frequently they are used. This variation is likely affected by what food has been on the dishes, how full the load is, and other factors.

As shown in Table 10, people typically prepare their loads using more than one technique. The table gives the percentage of a typical load that is pre-treated in each of four ways, with the total adding up to 100%. The table describes an average load for the whole sample, an average load for machines with soil sensors, and an average load for machines without soil sensors.

For the whole sample, 42% of the load is typically treated by using water (e.g., rinsing and soaking), while smaller proportions (23% and 27% respectively) are scraped without water and pre-treated with a combination of wet and dry techniques. Eight percent (8%) of the load typically receives no pre-treatment. Sixty-nine (69%) of the load is pre-treated in some manner that uses water (this combines 42% of the load treated by using water only and 27% which is pre-treated by a combination of wet and dry techniques). More detailed data on how often people use each type of technique can be found in Appendix B. Based on that more detailed data, only 2% of respondents say they never pre-treat any of their dishes.

Table 10 – Dish Pre-treatment (Q10-14)

How Load is Pre-treated	All Machines %	Soil-Sensor Machines %	Non Soil-Sensor Machines %
Percent of load where food is <i>removed by scraping only</i>	23	28	21
Percent of load where food is <i>removed by using water only</i>	42	41	43
Percent of load where food is <i>removed using scraping and water</i>	27	18	31
Percent of load where <i>no pre-treatment is done</i>	8	13	5
<i>N =</i>	<i>227</i>	<i>74</i>	<i>153</i>

Table 10 also shows that people with soil sensor machines generally pre-treat their dishes less than do those with machines without soil sensors. For example, on average, respondents with soil sensors do not pre-treat 13% of the load, while respondents without soil sensors do not pre-treat 5% of the load. Respondents without soil sensors appear to pre-treat more thoroughly (combining scraping and rinsing) on 31% of the load, while those with soil sensors do such thorough preparation on only 18% of the load.

For individuals who use water to pre-treat their dishes, we asked what temperature that water is generally. About half (51%) of respondents use warm water, a third (30%) use hot, and the remainder (18%) use cold (see Table 11).

Table 11 – Temperature of Water Used to Rinse or Soak Dishes (Q16)

Temperature	Number	Percentage
Hot water	62	30%
Warm water	104	51%
Cold water	36	18%
Don't Know/Refused	3	1%
	<i>N=205</i>	

Dish cleanliness before the machine is run

While data on pre-treating dishes provides some useful insights, the more crucial factor determining water/energy levels at which soil sensor machines operate is how dirty or clean the dishes are when the machine is turned on. Respondents were asked to think again about a typical load of dishes once it had been loaded into the dishwasher, before the machine was turned on. They were asked which percent of the load fit into each of the following categories:

- Very clean, with all or almost all of the food particles gone or invisible
- Somewhat clean, with some small bits of food and sauce visible
- Somewhat dirty, with only the biggest pieces of food removed
- Very dirty, with no or almost no food removed.

Detailed data on individual responses to these questions are in Appendix B. To simplify the data for cross-tabulations, however, we developed a mathematical calculation to

assign a single cleanliness score to each household’s typical load. The score is essentially a weighted average based on percentages given for each level of cleanliness. The score then assigns one level of cleanliness for the whole load based on the weighted average. (See Appendix C for the mathematical calculation.)

Table 12 shows that 45% of respondents run loads that are primarily very clean with little or no visible food. Another 38% of respondents run loads that are somewhat clean with some small food particles present. Finally, 17% of respondents run loads that are typically somewhat or very dirty.

Table 12 – Cleanliness Score for Overall Load (based on Q17-21)

Cleanliness Score	Number	Percentage
Very clean	102	45%
Somewhat clean	87	38%
Somewhat dirty	31	14%
Very dirty	7	3%
	N=227	

We then asked respondents to choose *one description* of how clean their load looked overall before the machine was turned on. As shown in Table 13, respondents tended to say their loads were more dirty than the cleanliness score we developed. A quarter of respondents (25%) rated their loads as very clean, with another 38% saying they were somewhat clean, and an equally large proportion (37%) saying their loads were at least somewhat dirty.

Table 13 – Respondents’ rating of load cleanliness overall (Q23)

Cleanliness Score	Number	Percentage
Very clean, with all or almost all food gone	56	25%
Somewhat clean, with small particles of food left	86	38%
Somewhat dirty, with only the largest chunks of food gone	76	33%
Very dirty, with no or almost no food removed	9	4%
Don’t know/refused	0	0%
	N=227	

We used both measures of cleanliness in cross-tabulations to see if the level of cleanliness varied significantly by soil sensor/non-soil sensor dishwashers, level of environmental awareness, and demographics. Consistent with the pre-treatment data, there is a significant difference between soil sensor and non-soil sensor machines in terms of how clean the dishes are prior to machine washing. As shown in Tables 14 and 15 below, soil sensor machines are more likely to have more dirty dishes in them prior to running than do machines without soil sensors.

For example, in Table 14 (which uses the cleanliness calculation) 54% of respondents with non-soil sensor machines have very clean loads, while only 26% of those with sensors are very clean. According to Table 15 (the respondents’ own overall rating),

32% of respondents with non-soil sensor machines report their loads are somewhat or very dirty, while 48% of respondents with soil sensors say their loads are somewhat or very dirty before the machine is turned on. No significant differences in dish cleanliness were found due to the level of environmental awareness.

Table 14 – Cleanliness Score by Soil Sensor

How clean load scores	Total	Soil sensor	No Soil sensor
Very clean	45%	26%	54%
Somewhat clean	38%	51%	32%
Somewhat dirty	14%	18%	12%
Very dirty	3%	5%	2%
N=	227	74	153

Table 15 – Respondents’ Overall Cleanliness Rating (Q23) by Soil Sensor

How clean load looks	Total	Soil sensor	No Soil sensor
Very clean	25%	22%	26%
Somewhat clean	38%	30%	42%
Somewhat dirty	33%	39%	31%
Very dirty	4%	9%	1%
N=	227	74	153

Dishwasher Performance and Respondent Satisfaction

Spotting and food particles left on dishes

Respondents were asked how often their dishes had spotting or streaking after they had been cleaned in the dishwasher, and how often food particles were left on the dishes after the machine had run. Tables 16 and 17 show that spotting/streaking and food particles are generally not a problem for most respondents: 87% said spotting occurs not too often or not at all often and 88% said food particles are left not too often or not at all often.

Table 16 – Spotting/Streaking on Dishes (Q24) by Household Size

How often	Total	Household Size		
		1-2	3-4	5 or more
Very often	4%	4%	3%	7%
Somewhat often	9%	7%	8%	21%
Not too often	31%	24%	38%	38%
Not at all often	56%	64%	51%	34%
N=	227	123	74	29

Table 17 – Food Particles Left on Dishes (Q25) by Household Size

How often	Total	Household Size		
		1-2	3-4	5 or more
Very often	3%	3%	0%	10%
Somewhat often	8%	7%	7%	17%
Not too often	34%	28%	43%	31%
Not at all often	54%	61%	47%	41%
N=	227	123	74	29

However, these tables also show that spotting and food particles are more of a problem for people living in larger households. The incidence of spotting jumps from 13% very or somewhat often for the whole population to 28% very or somewhat often for households of five people or more. Similarly, food particles are left on dishes very or somewhat often for 27% of individuals in larger households (compared to 11% very or somewhat often for the population as a whole).

While we did not ask specifically why spots or particles were left, we surmise that in larger households, the machine is typically more full than in smaller households. In fact, according to Table 7, which compared frequency of running the dishwasher by household size, while household size more than doubles from 1-2 people to 5 or more, frequency of running the dishwasher does not double (from 4.58 times/week to 7.38 times/week). There may also be less consistent pre-washing and more people may be involved in loading the machine in a larger household.

The incidence of spotting and food particles did not vary significantly by soil sensor/non-soil sensor machines or by level of environmental awareness. See Appendix B for details.

General satisfaction with dishwasher

Lastly, respondents were asked “In general, how satisfied are you with your dishwasher’s ability to clean your household’s dishes?” In the population as a whole, people are quite satisfied with their machines: 83% are very satisfied and another 12% are somewhat satisfied (see Table 18 below). When asked why they gave their satisfaction rating, respondents offered the following descriptions of their machines most frequently: gets the dishes clean (79%), quiet (66%), energy saving/efficient (31%), and water/efficient (30%). (Note that these responses total more than 100% because respondents could give more than one reason.) A complete list of reasons for satisfaction/dissatisfaction is in Appendix B.

As was the case for spotting and food particles, satisfaction levels are significantly lower among individuals from households of five or more. For instance, only 62% of respondents from households of 5 or more were very satisfied with their machines, compared to 89% for people from households of 1-2 people. It is likely that the incidence of spotting and food particles left on dishes contributes to this lower level of satisfaction. Overall satisfaction did not vary significantly by soil sensor/non-soil sensor or by level of environmental awareness. Detailed data can be found in Appendix B.

Table 18 – Respondent Satisfaction with Machine (Q26) by Household Size

How Satisfied	Total	Household Size		
		1-2	3-4	5 or more
Very satisfied	83%	89%	82%	62%
Somewhat satisfied	12%	8%	15%	21%
Not too satisfied	4%	3%	1%	3%
Not at all satisfied	1%	0%	1%	3%
<i>N=</i>	227	123	74	29

Appendix A: Final NEEA/OEO/CEE DISHWASHER Use SURVEY (February 12, 1999)

Q.1 Hello, may I please speak with _____ (READ NAME FROM LIST)? I'm calling on behalf of the Oregon Office of Energy and the Northwest Energy Efficiency Alliance. Our records show that you bought a new energy efficient dishwasher and you applied for an energy tax credit for this machine. We're doing a study on how people use and like their new machines and it would really help us if we could ask you a few questions on these topics. 1. Just to double check, does your household still have this dishwasher?

(5)
Yes .. 1
No ... 2

[IF THE ANSWER IS 1, THEN SKIP TO QUESTION 3]

Q.2 THIS IS A SCREEN OUT (DO NOT HAVE THE DISHWASHER). PRESS ENTER TO CONTINUE

_____ (5)

[IF THE ANSWER TO QUESTION 1 IS 2, THEN SKIP TO QUESTION 44]

Q.3 2. Are you the person in your household who most often prepares the dishes for loading the dishwasher?

(6)
Yes .. 1
No ... 2

[IF THE ANSWER IS 1, THEN SKIP TO QUESTION 9]

Q.4 Is the person in the household who most often prepares the dishes for loading available?

(7)
Yes .. 1
No ... 2

[IF THE ANSWER IS 1, THEN SKIP TO QUESTION 9]

Q.5 Would you say you know how dishes are prepared for loading the dishwasher in your home?

(8)
Yes 1
No, call back 2
No, do not call back .. 3

[IF THE ANSWER IS 2, THEN SKIP TO QUESTION 7]
[IF THE ANSWER IS 3, THEN SKIP TO QUESTION 8]

Q.6 Could we talk with you then?

(9)
Yes 1
No, call back 2
No, do not call back .. 3

[IF THE ANSWER IS 1, THEN SKIP TO QUESTION 9]
[IF THE ANSWER IS 3, THEN SKIP TO QUESTION 8]

Q.7 RECORD CALL BACK TIME ON SAMPLE. THIS IS A CALL BACK. PRESS ENTER TO CONTINUE.

_____ (6)

[IF THE ANSWER TO QUESTION 5 IS 2, THEN SKIP TO QUESTION 44]
[IF THE ANSWER TO QUESTION 6 IS 2, THEN SKIP TO QUESTION 44]

Q.8 THIS IS A REFUSAL DURING THE SCREENING QUESTIONS. PRESS ENTER TO CONTINUE.

_____ (7)

[IF THE ANSWER TO QUESTION 5 IS 3, THEN SKIP TO QUESTION 44]
[IF THE ANSWER TO QUESTION 6 IS 3, THEN SKIP TO QUESTION 44]

Q.9 3. First, please tell me how many times per week you usually run your dishwasher? (RECORD EXACT NUMBER)

NUMBER OF TIMES DISHWASHER IS RUN DURING THE WEEK ____ (10-11)

Q.10 4. Now, I'm going to read you four descriptions of what you might do when you prepare your dishes for the dishwasher: (1) I remove food WITHOUT USING WATER, SUCH AS scraping the food into a sink or garbage container. (2) I remove food USING WATER, such as by rinsing, washing, or soaking. (3) I combine scraping WITHOUT water and rinsing or soaking WITH water. OR (4) I load the dishes in the dishwasher without scraping, rinsing, or soaking. Now, I'd like you to think about an average load of dishes for your dishwasher that might include plates, silverware, glassware, pots and pans. After I read you each of the four descriptions again, I'd like you to tell me what percent of your average load falls under each statement. Your total needs to add up to 100 percent. (ENTER 0)

STARTING PERCENTAGE_____ (24-26)

[AN ANSWER OF NOT 0 IS INCONSISTENT WITH AN ANSWER OF 1-2 TO QUESTION 1]

Q.11 So, please tell me for what percent of your average dishwasher load have you REMOVED FOOD ONLY BY SCRAPING, WITHOUT USING WATER?

PERCENT OF LOAD WHERE FOOD IS REMOVED BY SCRAPING ONLY_____ (12-14)

[AN ANSWER OF 101-999 IS INCONSISTENT WITH AN ANSWER OF 1-2 TO QUESTION 1]

Q.12 So, please tell me for what percent of your average dishwasher load have you REMOVED FOOD BY USING WATER ONLY?

PERCENT OF LOAD WHERE FOOD IS REMOVED BY USING WATER ONLY_____ (15-17)

[AN ANSWER OF 101-999 IS INCONSISTENT WITH AN ANSWER OF 1-2 TO QUESTION 1]

Q.13 So, please tell me for what percent of your average dishwasher load have you COMBINED SCRAPING WITHOUT WATER AND USING WATER (RINSING, SOAKING, WASHING)?

PERCENT OF LOAD WHERE SCRAPING AND RINSING ARE COMBINED_____ (18-20)

[AN ANSWER OF 101-999 IS INCONSISTENT WITH AN ANSWER OF 1-2 TO QUESTION 1]

Q.14 So, please tell me for what percent of your average dishwasher load have you DONE NO SCRAPING, RINSING, OR SOAKING?

PERCENT OF LOAD WHERE NOTHING IS DONE TO PRE-WASH_____ (21-23)

[AN ANSWER OF 101-999 IS INCONSISTENT WITH AN ANSWER OF 1-2 TO QUESTION 1]

Q.15 (IF THE TOTAL LISTED BELOW IS 100, PRESS ENTER. IF IT IS NOT EQUAL TO 100, NOTE THE ANSWERS TO THE PREVIOUS QUESTIONS AND REMIND THE RESPONDENT THE ANSWERS NEED TO ADD UP TO 100%. TAB TO QUESTION 10.) REMOVED FOOD BY SCRAPING: && REMOVED FOOD BY USING WATER ONLY: && COMBINED SCRAPING WITHOUT WATER AND USING WATER: && DONE NO SCRAPING, RINSING, OR SOAKING: &&

TOTAL PERCENTAGE_____ (24-26)

[AN ANSWER OF NOT 100 IS INCONSISTENT WITH AN ANSWER OF 1 TO QUESTION 1]

[IF THE ANSWER TO QUESTION 12 IS 0, AND...]
[IF THE ANSWER TO QUESTION 13 IS 0, THEN SKIP TO QUESTION 17]

Q.16 5. When you rinse or soak your dishes in water, do you generally use ... ? (READ LIST)

(27)
Hot water1
Warm water2
Cold water3
DON'T KNOW/REFUSED ..4

Q.17 6. Now, imagine that you've loaded all of your dishes into the dishwasher but you haven't turned it on. I am going to read you four descriptions about how clean your dishes look before you run the dishwasher: (1) They are very clean, with all or almost all the food particles gone or invisible. (2) They are somewhat clean, with some small bits of food and sauce visible. (3) They are somewhat dirty, with only the biggest pieces of food removed. (4) They are very dirty, with no or almost no food removed. Now, as I read each description again, please tell me what percent of your dishes fall under each one. Remember, the percentages must add up to 100. (ENTER 0)

STARTING PERCENTAGE_____ (40-42)

[AN ANSWER OF NOT 0 IS INCONSISTENT WITH AN ANSWER OF 1-2 TO QUESTION 1]

Q.18 What percent of the load is VERY CLEAN, WITH ALL OR ALMOST FOOD AND SAUCE GONE?

PERCENTAGE OF DISHES THAT ARE VERY CLEAN_____ (28-30)

[AN ANSWER OF 101-999 IS INCONSISTENT WITH AN ANSWER OF 1-2 TO QUESTION 1]

Q.19 What percent of the load is SOMEWHAT CLEAN, WITH SMALL PARTICLES OF FOOD LEFT?

PERCENTAGE OF DISHES THAT ARE SOMEWHAT CLEAN (31-33)

[AN ANSWER OF 101-999 IS INCONSISTENT WITH AN ANSWER OF 1-2 TO QUESTION 1]

Q.20 What percent of the load is SOMEWHAT DIRTY, WITH ONLY THE LARGEST CHUNKS OF FOOD REMOVED?

PERCENTAGE OF DISHES THAT ARE SOMEWHAT DIRTY (34-36)

[AN ANSWER OF 101-999 IS INCONSISTENT WITH AN ANSWER OF 1-2 TO QUESTION 1]

Q.21 What percent of the load is VERY DIRTY, WITH NO OR ALMOST NO FOOD REMOVED?

PERCENTAGE OF DISHES THAT ARE VERY DIRTY (37-39)

[AN ANSWER OF 101-999 IS INCONSISTENT WITH AN ANSWER OF 1-2 TO QUESTION 1]

Q.22 (IF THE TOTAL LISTED BELOW IS 100, PRESS ENTER. IF IT IS NOT EQUAL TO 100, NOTE THE ANSWERS TO THE PREVIOUS QUESTIONS AND REMIND THE RESPONDENT THE ANSWERS NEED TO ADD UP TO 100%. TAB TO QUESTION 17.) VERY CLEAN, WITH ALL OR ALMOST ALL FOOD AND SAUCE GONE: && SOMEWHAT CLEAN, WITH SMALL PARTICLES OF FOOD LEFT: && SOMEWHAT DIRTY, WITH ONLY THE LARGEST CHUNKS OF FOOD REMOVED: && VERY DIRTY, WITH NO OR ALMOST NO FOOD REMOVED: &&

TOTAL PERCENTAGE (40-42)

[AN ANSWER OF NOT 100 IS INCONSISTENT WITH AN ANSWER OF 1-2 TO QUESTION 1]

Q.23 7. Now, please think about that average load of dishes one more time. If you had to choose one description of how clean that load looks OVERALL, before your turn on your dishwasher, would you say your dishes look ... ? (READ LIST)

- (43)
- Very clean, with all or almost all food and sauce gone1
- Somewhat clean, with small particles of food left2
- Somewhat dirty, with only the largest chunks of food gone ..3
- Very dirty, with no or almost no food removed4
- DON'T KNOW/REFUSED5

Q.24 Now I'd like to ask you a few questions about how your dishwasher cleans your dishes.
8. How often would you say your dishes and/or glassware have any spotting or streaking after they have been cleaned in your dishwasher? Would you say ... ? (READ LIST)

- (44)
- Very often1
 - Somewhat often2
 - Not too often3
 - Not at all often4
 - DON'T KNOW/REFUSED ..5

Q.25 9. How often are food particles left on your dishes and/or pots and pans after they have been cleaned in your dishwasher? Would you say ... ? (READ LIST)

- (45)
- Very often1
 - Somewhat often2
 - Not too often3
 - Not at all often4
 - DON'T KNOW/REFUSED ..5

Q.26 10. In general, how satisfied are you with your dishwasher's ability to clean your household's dishes? Would you say ... ? (READ LIST)

- (46)
- Very satisfied1
 - Somewhat satisfied2
 - Not too satisfied3
 - Not at all satisfied4
 - DON'T KNOW/REFUSED ..5

[IF THE ANSWER IS 5, THEN SKIP TO QUESTION 29]

Q.27 11. Why do you say you are && with your dishwasher? (DO NOT READ LIST. ACCEPT MULTIPLE RESPONSES.)

- (47-62)
- Gets the dishes clean01
 - Easy to load, fit dishes in02
 - Energy saving/efficient03
 - Water saving/efficient04
 - Saves money05
 - Quiet06
 - Has good cycles to choose from07
 - OTHER (SPECIFY)08
 - DON'T KNOW/REFUSED09
 - Doesn't clean very well10
 - Doesn't save money11
 - Doesn't like drying cycle12
 - Mechanical problems - broken or gets stuck ..13
 - Pre-washing isn't necessary14
 - It is old16
 - Time-saving19
 - Noisy20
 - Easy in maintain21

[IF THE ANSWER IS 8, THEN SKIP TO QUESTION 28]
[IF THE ANSWER IS 1-7 OR 9, THEN SKIP TO QUESTION 29]

Q.28 11. (WHY DO YOU SAY YOU ARE && WITH YOUR DISHWASHER?) SPECIFY OTHER

_____ (76-150)

Q.29 12. Now I'd like you to think about some environmental activities and viewpoints. For each of the following statements, please tell me how well that statement describes you. Tell me if it describes you very well, describes you somewhat, describes you a little, or doesn't describe you at all. (PRESS ENTER TO CONTINUE)

_____ (10)

Q.30 DOES THIS STATEMENT DESCRIBE YOU VERY WELL, DESCRIBE YOU SOMEWHAT, DESCRIBE YOU A LITTLE, OR NOT DESCRIBE YOU AT ALL: I buy products that use recycled materials.

- (63)
- Describes very well 1
 - Describes somewhat 2
 - Describes a little3
 - Doesn't describe at all 4

DON'T KNOW/REFUSED ..5

Q.31 DOES THIS STATEMENT DESCRIBE YOU VERY WELL, DESCRIBE YOU SOMEWHAT, DESCRIBE YOU A LITTLE, OR NOT DESCRIBE YOU AT ALL: I recycle or reuse household waste, including paper, cans and bottles

(64)

Describes very well1
Describes somewhat2
Describes a little3
Doesn't describe at all4
DON'T KNOW/REFUSED ..5

Q.32 DOES THIS STATEMENT DESCRIBE YOU VERY WELL, DESCRIBE YOU SOMEWHAT, DESCRIBE YOU A LITTLE, OR NOT DESCRIBE YOU AT ALL: I choose energy-efficient products over less efficient ones.

(65)

Describes very well1
Describes somewhat2
Describes a little3
Doesn't describe at all4
DON'T KNOW/REFUSED ..5

Q.33 DOES THIS STATEMENT DESCRIBE YOU VERY WELL, DESCRIBE YOU SOMEWHAT, DESCRIBE YOU A LITTLE, OR NOT DESCRIBE YOU AT ALL: I have made my home energy-efficient.

(66)

Describes very well1
Describes somewhat2
Describes a little3
Doesn't describe at all4
DON'T KNOW/REFUSED ..5

Q.34 DOES THIS STATEMENT DESCRIBE YOU VERY WELL, DESCRIBE YOU SOMEWHAT, DESCRIBE YOU A LITTLE, OR NOT DESCRIBE YOU AT ALL: I choose water saving products over products that use more water.

(67)

Describes very well1
Describes somewhat2
Describes a little3
Doesn't describe at all4
DON'T KNOW/REFUSED ..5

Q.35 DOES THIS STATEMENT DESCRIBE YOU VERY WELL, DESCRIBE YOU SOMEWHAT, DESCRIBE YOU A LITTLE, OR NOT DESCRIBE YOU AT ALL: I have made my home water-efficient.

- (68)
- Describes very well 1
 - Describes somewhat 2
 - Describes a little 3
 - Doesn't describe at all 4
 - DON'T KNOW/REFUSED ..5

Q.36 DOES THIS STATEMENT DESCRIBE YOU VERY WELL, DESCRIBE YOU SOMEWHAT, DESCRIBE YOU A LITTLE, OR NOT DESCRIBE YOU AT ALL: I choose environmentally safe household and gardening products.

- (69)
- Describes very well 1
 - Describes somewhat 2
 - Describes a little 3
 - Doesn't describe at all 4
 - DON'T KNOW/REFUSED ..5

Q.37 13. Overall, would you describe yourself as someone who is very involved in taking steps that save the environment, somewhat involved in taking steps that save the environment, not too involved in taking steps that save the environment, or not at all involved in taking steps that save the environment.

- (70)
- Very involved 1
 - Somewhat involved 2
 - Not too involved 3
 - Not at all involved 4
 - DON'T KNOW/REFUSED ..5

Q.38 Now, I have just a few last questions about your household. 14. How many children and adults, including yourself, live in your household most of the year?

OF PEOPLE IN HOUSEHOLD MOST OF THE YEAR (71-72)

Q.39 15. How long have you lived in the Northwest (usually Oregon, Washington, Idaho, Alaska, Montana)?

- (73)
- Less than 1 year 1
 - 1-2 years 2
 - 3-5 years 3
 - 6-8 years 4
 - 9 years or more 5

DON'T KNOW/REFUSED ..6

Q.40 16. Could you tell me your educational level? (DO NOT READ LIST. IF THE RESPONDENT IS HESITANT, USE AS A PROMPT:) Would you say you have completed ... ? (READ LIST)

- (74)
- Graduate school (beyond a college degree) .. 1
- College degree2
- Some college or a technical school3
- High school4
- Less than high school5
- DON'T KNOW/REFUSED6

Q.41 17. Finally, please tell me which of the following categories best describes your total household income for 1998? Is it ... ? (READ LIST)

- (75)
- Under \$25,000 1
- \$25,000 - \$50,0002
- \$50,000 - \$75,0003
- \$75,000 - \$100,0004
- \$100,000 or more 5
- DON'T KNOW/REFUSED ..6

Q.42 On occasion, my supervisor calls back to verify that I asked all of the questions correctly. For this purpose only, may I please record your name? (IF HESITANT) Your initials?

_____ (151-215)

Q.43 And the phone number I called was _____? (VERIFY PHONE NUMBER FROM SAMPLE. AS AN EXAMPLE, OUR PHONE NUMBER WOULD BE ENTERED AS 2533831100)

_____ (216-225)

Q.44 RECORD RESPONDENT ID NUMBER FROM SAMPLE LIST. (IF THERE IS NO ID NUMBER, ENTER 0000)

RESPONDENT ID NUMBER_____ (76-79)

Q.45 RECORD SOIL SENSOR/NOT SOIL SENSOR MACHINE CODE FROM SAMPLE LIST.

- (80)
- Yes .. 1
- No ... 2

Q.46 RECORD INTERVIEWER CODE

(81-82)

INTERVIEWER #101
INTERVIEWER #202
INTERVIEWER #303
INTERVIEWER #404
INTERVIEWER #505
INTERVIEWER #606
INTERVIEWER #707
INTERVIEWER #808
INTERVIEWER #909
INTERVIEWER #10 ..10
INTERVIEWER #11 ..11
INTERVIEWER #12 ..12
INTERVIEWER #13 ..13
INTERVIEWER #14 ..14
INTERVIEWER #15 ..15
INTERVIEWER #16 ..16
INTERVIEWER #17 ..17
INTERVIEWER #18 ..18
INTERVIEWER #19 ..19
INTERVIEWER #20 ..20
INTERVIEWER #21 ..21
INTERVIEWER #22 ..22
INTERVIEWER #23 ..23
INTERVIEWER #24 ..24

Q.47 RECORD DATE OF INTERVIEW

(83-84)

February 1, 199901
February 2, 199902
February 3, 199903
February 4, 199904
February 5, 199905
February 6, 199906
February 7, 199907
February 8, 199908
February 9, 199909
February 10, 1999 ..10
February 11, 1999 ..11
February 12, 1999 ..12
February 13, 1999 ..13
February 14, 1999 ..14
February 15, 1999 ..15
February 16, 1999 ..16

Q.48 RECORD WHETHER THIS SURVEY WAS A COMPLETE, A TERMINATE MIDWAY, A SCREEN OUT, A CALL BACK, OR A REFUSAL.

	(85)
Complete	1
Terminate Midway	2
Screen Out	3
Call Back	4
Refusal During the Screening Process ..	5

Q.49 LENGTH OF INTERVIEW (IN MINUTES)

LENGTH OF INTERVIEW IN MINUTES_____ (107-108)

**Appendix B: Frequencies and Crosstab Tables
DISHWASHER SURVEY (February 12, 1999)**

Note: Frequencies and crosstabs follow the question order of the survey.

Q9. First, please tell me how many times per week you usually run your dishwasher? (RECORD EXACT NUMBER)

	TOTAL
Base	227
NUMBER OF TIMES DISHWASHER IS RUN DURING THE WEEK	5.38

MDRC/Dethman and Associates (Ref. # MR061-9546)

DISHWASHER SURVEY (February 12, 1999)

Q9. First, please tell me how many times per week you usually run your dishwasher? (RECORD EXACT NUMBER)

NUMBER OF TIMES DISHWASHER IS RUN DURING THE WEEK

	TOTAL
Base	227
1	4 2%
2	19 8%
3	33 15%
4	38 17%
5	32 14%
6	14 6%
7	67 30%
8	3 1%
9	3 1%
10	8 4%
14	5 2%
15	1 0%

DISHWASHER SURVEY (February 12, 1999)

Q11: So, please tell me for what percent of your average dishwasher load have you REMOVED FOOD ONLY BY SCRAPING, WITHOUT USING WATER?

	TOTAL
Base	<hr/> 227
PERCENT OF LOAD WHERE FOOD IS REMOVED BY SCRAPING ONLY	23.07

MDRC/Dethman and Associates (Ref. # MR061-9546)

DISHWASHER SURVEY (February 12, 1999)

Q 11: So, please tell me for what percent of your average dishwasher load have you REMOVED FOOD ONLY BY SCRAPING, WITHOUT USING WATER?

PERCENT OF LOAD WHERE FOOD IS REMOVED BY SCRAPING ONLY

	TOTAL
Base	<hr/> 227
0	101 44%
2	2 1%
5	6 3%
10	20 9%
15	3 1%
20	18 8%
25	10 4%
30	8 4%
35	1 0%
40	6 3%
50	16 7%
60	5 2%
70	2 1%

DISHWASHER SURVEY (February 12, 1999)

Q11: So, please tell me for what percent of your average dishwasher load have you REMOVED FOOD ONLY BY SCRAPING, WITHOUT USING WATER?

PERCENT OF LOAD WHERE FOOD IS REMOVED BY SCRAPING ONLY

	TOTAL
Base	<hr/> 227
75	9 4%
80	2 1%
90	4 2%
98	1 0%
100	13 6%

DISHWASHER SURVEY (February 12, 1999)

Q12: So, please tell me for what percent of your average dishwasher load have you REMOVED FOOD BY USING WATER ONLY?

	TOTAL
	<hr/>
Base	227
PERCENT OF LOAD WHERE FOOD IS REMOVED BY USING WATER ONLY	42.08

MDRC/Dethman and Associates (Ref. # MR061-9546)

DISHWASHER SURVEY (February 12, 1999)

Q 12: So, please tell me for what percent of your average dishwasher load have you REMOVED FOOD BY USING WATER ONLY?

PERCENT OF LOAD WHERE FOOD IS REMOVED BY USING WATER ONLY

	TOTAL
Base	227
0	54 24%
5	6 3%
10	21 9%
15	2 1%
20	10 4%
25	10 4%
30	6 3%
35	4 2%
40	6 3%
50	34 15%
60	5 2%
70	8 4%
75	8 4%

DISHWASHER SURVEY (February 12, 1999)

Q 12: So, please tell me for what percent of your average dishwasher load have you REMOVED FOOD BY USING WATER ONLY?

PERCENT OF LOAD WHERE FOOD IS REMOVED BY USING WATER ONLY

	TOTAL
Base	<hr/> 227
80	6 3%
90	5 2%
95	3 1%
98	1 0%
100	38 17%

MDRC/Dethman and Associates (Ref. # MR061-9546)

DISHWASHER SURVEY (February 12, 1999)

Q13: So, please tell me for what percent of your average dishwasher load have you COMBINED SCRAPING WITHOUT WATER AND USING WATER (RINSING, SOAKING, WASHING)?

	TOTAL
Base	<hr/> 227
PERCENT OF LOAD WHERE SCRAPING AND RINSING ARE COMBINED	26.79

MDRC/Dethman and Associates (Ref. # MR061-9546)

DISHWASHER SURVEY (February 12, 1999)

Q 13: So, please tell me for what percent of your average dishwasher load have you COMBINED SCRAPING WITHOUT WATER AND USING WATER (RINSING, SOAKING, WASHING)?

PERCENT OF LOAD WHERE SCRAPING AND RINSING ARE COMBINED

	TOTAL
Base	<hr/> 227
0	95 42%
2	1 0%
5	4 2%
10	18 8%
15	5 2%
20	19 8%
25	11 5%
30	6 3%
35	1 0%
40	8 4%
45	2 1%
50	16 7%

DISHWASHER SURVEY (February 12, 1999)

Q 13: So, please tell me for what percent of your average dishwasher load have you COMBINED SCRAPING WITHOUT WATER AND USING WATER (RINSING, SOAKING, WASHING)?

PERCENT OF LOAD WHERE SCRAPING AND RINSING ARE COMBINED

	TOTAL
Base	<hr/> 227
55	1 0%
60	3 1%
70	2 1%
75	1 0%
80	3 1%
85	1 0%
90	4 2%
95	2 1%
100	24 11%

DISHWASHER SURVEY (February 12, 1999)

Q 14: So, please tell me for what percent of your average dishwasher load have you DONE NO SCRAPING, RINSING, OR SOAKING?

	TOTAL
Base	<hr/> 227
PERCENT OF LOAD WHERE NOTHING IS DONE TO PRE-WASH	8.05

MDRC/Dethman and Associates (Ref. # MR061-9546)

DISHWASHER SURVEY (February 12, 1999)

Q 14: So, please tell me for what percent of your average dishwasher load have you DONE NO SCRAPING, RINSING, OR SOAKING?

PERCENT OF LOAD WHERE NOTHING IS DONE TO PRE-WASH

	TOTAL
Base	227
0	173 76%
3	1 0%
5	3 1%
10	12 5%
15	1 0%
20	13 6%
25	4 2%
30	2 1%
35	1 0%
40	3 1%
50	3 1%
60	1 0%
70	3 1%

DISHWASHER SURVEY (February 12, 1999)

Q14: So, please tell me for what percent of your average dishwasher load have you DONE NO SCRAPING, RINSING, OR SOAKING?

PERCENT OF LOAD WHERE NOTHING IS DONE TO PRE-WASH

	TOTAL
Base	227
90	2 1%
100	5 2%

MDRC/Dethman and Associates (Ref. # MR061-9546)

DISHWASHER SURVEY (February 12, 1999)

Q 18: What percent of the load is VERY CLEAN, WITH ALL OR ALMOST FOOD AND SAUCE GONE?

	TOTAL
	<hr/>
Base	227
PERCENTAGE OF DISHES THAT ARE VERY CLEAN	44.95

MDRC/Dethman and Associates (Ref. # MR061-9546)

DISHWASHER SURVEY (February 12, 1999)

Q18: What percent of the load is VERY CLEAN, WITH ALL OR ALMOST FOOD AND SAUCE GONE?

PERCENTAGE OF DISHES THAT ARE VERY CLEAN

	TOTAL
Base	227
0	61 27%
5	1 0%
10	19 8%
15	1 0%
20	13 6%
25	8 4%
30	4 2%
35	1 0%
40	5 2%
50	30 13%
60	6 3%
70	1 0%
75	5 2%

DISHWASHER SURVEY (February 12, 1999)

Q 18: What percent of the load is VERY CLEAN, WITH ALL OR ALMOST FOOD AND SAUCE GONE?

PERCENTAGE OF DISHES THAT ARE VERY CLEAN

	TOTAL
Base	227
80	8 4%
85	2 1%
90	12 5%
95	3 1%
99	1 0%
100	46 20%

MDRC/Dethman and Associates (Ref. # MR061-9546)

DISHWASHER SURVEY (February 12, 1999)

Q 19: What percent of the load is SOMEWHAT CLEAN, WITH SMALL PARTICLES OF FOOD LEFT?

	TOTAL
	<hr/>
Base	227
PERCENTAGE OF DISHES THAT ARE SOMEWHAT CLEAN	31.31

MDRC/Dethman and Associates (Ref. # MR061-9546)

DISHWASHER SURVEY (February 12, 1999)

Q19: What percent of the load is SOMEWHAT CLEAN, WITH SMALL PARTICLES OF FOOD LEFT?

PERCENTAGE OF DISHES THAT ARE SOMEWHAT CLEAN

	TOTAL
Base	227
0	69 30%
2	1 0%
5	3 1%
10	17 7%
15	4 2%
20	21 9%
25	16 7%
30	9 4%
40	13 6%
50	31 14%
60	7 3%
65	1 0%
75	7 3%
80	4 2%

DISHWASHER SURVEY (February 12, 1999)

Q 19: What percent of the load is SOMEWHAT CLEAN, WITH SMALL PARTICLES OF FOOD LEFT?

PERCENTAGE OF DISHES THAT ARE SOMEWHAT CLEAN

	<u>TOTAL</u>
Base	227
90	3 1%
100	21 9%

MDRC/Dethman and Associates (Ref. # MR061-9546)

DISHWASHER SURVEY (February 12, 1999)

Q 20: What percent of the load is SOMEWHAT DIRTY, WITH ONLY THE LARGEST CHUNKS OF FOOD REMOVED?

	TOTAL
	<hr/>
Base	227
PERCENTAGE OF DISHES THAT ARE SOMEWHAT DIRTY	18.28

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DISHWASHER SURVEY (February 12, 1999)

Q 20: What percent of the load is SOMEWHAT DIRTY, WITH ONLY THE LARGEST CHUNKS OF FOOD REMOVED?

PERCENTAGE OF DISHES THAT ARE SOMEWHAT DIRTY

	TOTAL
Base	227
0	120 53%
1	1 0%
3	1 0%
10	14 6%
15	1 0%
20	23 10%
25	16 7%
30	7 3%
40	8 4%
50	13 6%
55	1 0%
60	3 1%
70	3 1%

DISHWASHER SURVEY (February 12, 1999)

Q 20: What percent of the load is SOMEWHAT DIRTY, WITH ONLY THE LARGEST CHUNKS OF FOOD REMOVED?

PERCENTAGE OF DISHES THAT ARE SOMEWHAT DIRTY

	TOTAL
Base	227
75	2 1%
80	2 1%
95	1 0%
100	11 5%

MDRC/Dethman and Associates (Ref. # MR061-9546)

DISHWASHER SURVEY (February 12, 1999)

Q 21: What percent of the load is VERY DIRTY, WITH NO OR ALMOST NO FOOD REMOVED?

	TOTAL
	<hr/>
Base	227
PERCENTAGE OF DISHES THAT ARE VERY DIRTY	5.46

MDRC/Dethman and Associates (Ref. # MR061-9546)

DISHWASHER SURVEY (February 12, 1999)

Q21: What percent of the load is VERY DIRTY, WITH NO OR ALMOST NO FOOD REMOVED?

PERCENTAGE OF DISHES THAT ARE VERY DIRTY

	TOTAL
Base	227
0	182 80%
5	6 3%
10	10 4%
20	15 7%
25	5 2%
30	1 0%
50	2 1%
75	1 0%
90	2 1%
100	3 1%

DISHWASHER SURVEY (February 12, 1999)

Q 26. In general, how satisfied are you with your dishwasher's ability to clean your household's dishes? Would you say ... ? (READ LIST)

	TOTAL
Base	<hr/> 227
Very satisfied	189 83%
Somewhat satisfied	27 12%
Not too satisfied	9 4%
Not at all satisfied	2 1%
DON'T KNOW/REFUSED	0 0%

MDRC/Dethman and Associates (Ref. # MR061-9546)

DISHWASHER SURVEY (February 12, 1999)

Q 27. Why do you say you are (insert response from Q26) with your dishwasher? (DO NOT READ LIST. ACCEPT MULTIPLE RESPONSES.)

	TOTAL
Base	<u>227</u>
Gets the dishes clean	179 79%
Quiet	150 66%
Energy saving/efficient	70 31%
Water saving/efficient	67 30%
Has good cycles to choose from	62 27%
Easy to load, fit dishes in	54 24%
Saves money	42 19%
Doesn't clean very well	15 7%
OTHER (SPECIFY)	9 4%
Doesn't like drying cycle	8 4%
Mechanical problems - broken or gets stuck	3 1%
It is old	2 1%
DON'T KNOW/REFUSED	1 0%
Doesn't save money	1 0%

DISHWASHER SURVEY (February 12, 1999)

Q 27. Why do you say you are && with your dishwasher? (DO NOT READ LIST. ACCEPT MULTIPLE RESPONSES.)

	<u>TOTAL</u>
Base	227
Pre-washing isn't necessary	1 0%
Time-saving	1 0%
Noisy	1 0%
Easy to maintain	2 1%

MDRC/Dethman and Associates (Ref. # MR061-9546)

DISHWASHER SURVEY (February 12, 1999)

Q 30: DOES THIS STATEMENT DESCRIBE YOU VERY WELL, DESCRIBE YOU SOMEWHAT, DESCRIBE YOU A LITTLE, OR NOT DESCRIBE YOU AT ALL: I buy products that use recycled materials.

	TOTAL
Base	<hr/> 227
Describes very well	86 38%
Describes somewhat	95 42%
Describes a little	28 12%
Doesn't describe at all	14 6%
DON'T KNOW/REFUSED	4 2%

MDRC/Dethman and Associates (Ref. # MR061-9546)

DISHWASHER SURVEY (February 12, 1999)

Q 31: DOES THIS STATEMENT DESCRIBE YOU VERY WELL, DESCRIBE YOU SOMEWHAT, DESCRIBE YOU A LITTLE, OR NOT DESCRIBE YOU AT ALL: I recycle or reuse household waste, including paper, cans and bottles

	TOTAL
Base	<hr/> 227
Describes very well	148 65%
Describes somewhat	45 20%
Describes a little	15 7%
Doesn't describe at all	14 6%
DON'T KNOW/REFUSED	5 2%

MDRC/Dethman and Associates (Ref. # MR061-9546)

DISHWASHER SURVEY (February 12, 1999)

Q32: DOES THIS STATEMENT DESCRIBE YOU VERY WELL, DESCRIBE YOU SOMEWHAT, DESCRIBE YOU A LITTLE, OR NOT DESCRIBE YOU AT ALL: I choose energy-efficient products over less efficient ones.

	TOTAL
Base	<hr/> 227
Describes very well	148 65%
Describes somewhat	61 27%
Describes a little	11 5%
Doesn't describe at all	4 2%
DON'T KNOW/REFUSED	3 1%

MDRC/Dethman and Associates (Ref. # MR061-9546)

DISHWASHER SURVEY (February 12, 1999)

Q33: DOES THIS STATEMENT DESCRIBE YOU VERY WELL, DESCRIBE YOU SOMEWHAT, DESCRIBE YOU A LITTLE, OR NOT DESCRIBE YOU AT ALL: I have made my home energy-efficient.

	TOTAL
Base	<hr/> 227
Describes very well	129 57%
Describes somewhat	79 35%
Describes a little	10 4%
Doesn't describe at all	7 3%
DON'T KNOW/REFUSED	2 1%

MDRC/Dethman and Associates (Ref. # MR061-9546)

DISHWASHER SURVEY (February 12, 1999)

Q34: DOES THIS STATEMENT DESCRIBE YOU VERY WELL, DESCRIBE YOU SOMEWHAT, DESCRIBE YOU A LITTLE, OR NOT DESCRIBE YOU AT ALL: I choose water saving products over products that use more water.

	TOTAL
Base	<hr/> 227
Describes very well	136 60%
Describes somewhat	62 27%
Describes a little	11 5%
Doesn't describe at all	8 4%
DON'T KNOW/REFUSED	10 4%

MDRC/Dethman and Associates (Ref. # MR061-9546)

DISHWASHER SURVEY (February 12, 1999)

Q35: DOES THIS STATEMENT DESCRIBE YOU VERY WELL, DESCRIBE YOU SOMEWHAT, DESCRIBE YOU A LITTLE, OR NOT DESCRIBE YOU AT ALL: I have made my home water-efficient.

	TOTAL
Base	<hr/> 227
Describes very well	111 49%
Describes somewhat	85 37%
Describes a little	13 6%
Doesn't describe at all	13 6%
DON'T KNOW/REFUSED	5 2%

MDRC/Dethman and Associates (Ref. # MR061-9546)

DISHWASHER SURVEY (February 12, 1999)

Q36: DOES THIS STATEMENT DESCRIBE YOU VERY WELL, DESCRIBE YOU SOMEWHAT, DESCRIBE YOU A LITTLE, OR NOT DESCRIBE AT ALL: I choose environmentally safe household and gardening products.

	TOTAL
Base	<hr/> 227
Describes very well	105 46%
Describes somewhat	86 38%
Describes a little	29 13%
Doesn't describe at all	5 2%
DON'T KNOW/REFUSED	2 1%

MDRC/Dethman and Associates (Ref. # MR061-9546)

DISHWASHER SURVEY (February 12, 1999)

Q38. How many children and adults, including yourself, live in your household most of the year?

OF PEOPLE IN HOUSEHOLD MOST OF THE YEAR

	TOTAL
Base	227
0	1 0%
1	13 6%
2	110 48%
3	38 17%
4	36 16%
5	22 10%
6	4 2%
7	2 1%
8	1 0%

DISHWASHER SURVEY (February 12, 1999)

Q39. How long have you lived in the Northwest (usually Oregon, Washington, Idaho, Alaska, Montana)?

	TOTAL
Base	<u>227</u>
Less than 1 year	2 1%
1-2 years	7 3%
3-5 years	12 5%
6-8 years	8 4%
9 years or more	196 86%
DON'T KNOW/REFUSED	2 1%

MDRC/Dethman and Associates (Ref. # MR061-9546)

DISHWASHER SURVEY (February 12, 1999)

Q40. Could you tell me your educational level? (DO NOT READ LIST. IF THE RESPONDENT IS HESITANT, USE AS A PROMPT:)
Would you say you have completed ... ? (READ LIST)

	TOTAL
Base	227
Graduate school (beyond a college degree)	28 12%
College degree	75 33%
Some college or a technical school	67 30%
High school	39 17%
Less than high school	8 4%
DON'T KNOW/REFUSED	10 4%

MDRC/Dethman and Associates (Ref. # MR061-9546)

TABLE 45: RECORD SOIL SENSOR/NOT SOIL SENSOR MACHINE CODE FROM SAMPLE LIST.

	TOTAL
Base	□□□□□ 227
Yes	74 33%
No	153 67%

MDRC/Dethman and Associates (Ref. # MR061-9546)

APPENDIX C

Calculation for Environmental Behavior Score, based on responses to Q29-Q36

Q29 is an overview statement; no response is given. Then seven separate behaviors are presented (Q30-36). For each of these seven behaviors, responses are pre-coded as follows:

- 1 – describes very well
- 2 – describes somewhat
- 3 – describes a little
- 4 – doesn't describe at all

To develop the environmental behavior score, we added the pre-coded number from each of 7 questions (Q30-36). This total score was then labeled as follows:

- 7-11 = very environmental
- 12-17 = somewhat environmental
- 18-23 = a little environmental
- 24-28 = not at all environmental

We then ran frequencies on these overall scores; these are presented in the body of the report.

Calculation for Cleanliness Score, based on responses to Q17-Q21

Q17 is an overview statement; no response is given. Q18-21 then ask what percent of total load is:

Q18: Very clean

Q19: Somewhat clean

Q20: Somewhat dirty

Q21: Very dirty

To develop the score, we first applied a numeric value to each level of cleanliness as follows:

Very clean – 4

Somewhat clean – 3

Somewhat dirty – 2

Very dirty – 1

We then multiplied that value (1 through 4) by the percent of time that the respondent said the load was at a certain level of cleanliness (very clean, somewhat clean, and so on). We then added these four numbers and divided by 4. For example, if a respondent said that his/her typical load was 20% very clean, 30% somewhat clean, 40% somewhat dirty, and 10% very dirty, the calculation would be done as follows:

VC: $20\% \times 4 = 80$

SC: $30\% \times 3 = 90$

SD: $40\% \times 2 = 80$

VD: $\frac{10\%}{100\%} \times 1 = \frac{10}{100}$

$\frac{260}{4} = 65$. The final cleanliness score is 65

We then coded the scores as follows, in order to run the frequencies that are presented in the report:

Score:

82-100 = very clean

63-81 = somewhat clean

44-62 = somewhat dirty

25-43 = very dirty

In the example, the score of 65 is coded as somewhat clean. The load is considered primarily somewhat clean.