

Produced by



as part of the **Local Hazardous  
Waste Management Program**  
in King County

SQG-MERCURY-6 (3/07)  
March 2007



**Final Report**

# **Mercury Thermostat Recycling in King County**

**Gail Savina, M.S., M.A.**

Local Hazardous Waste Management Program in King County

This report was prepared by the Local Hazardous Waste Management Program in King County, Washington. The program works to protect and enhance public health and environmental quality in King County by reducing the threat posed by the production, use, storage and disposal of hazardous materials.

For more information or to order additional copies of this report contact:

Produced by



King County

as part of the **Local Hazardous  
Waste Management Program  
in King County**

130 Nickerson Street, Suite 100  
Seattle, WA 98109  
206-263-3050 TTY Relay: 711  
Fax 206-263-3070

[www.govlink.org/hazwaste/](http://www.govlink.org/hazwaste/)

**Publication Number: SQG-MERCURY-6 (3/07)**

Savina, Gail. *Mercury Thermostat Recycling in King County – Summary Report*. Seattle, WA:  
Local Hazardous Waste Management Program in King County, 2007.

Alternate Formats Available

Voice: 206-263-3050 or TTY Relay: 711



# CONTENTS

Summary .....	1
Mercury thermostats recycled: Totals.....	3
Mercury thermostat recycling rates .....	5
Effect of a cash incentive.....	6
Sales of mercury thermostats .....	9
Conclusions and recommendations.....	10

## Figures

Figure 1. Mercury thermostats (cumulative) collected during cash incentive pilot project by participating and non-participating suppliers, 2004-05 .....	6
Figure 2. Mercury thermostats collected in King County by month, Jan 2004- Dec 2006 ....	7

## Tables

Table 1. Mercury thermostats recycled via TRC, 2004 – 2006.....	3
Table 2. Numbers of TRC collection sites and thermostats recycled, 2003- 2006.....	3
Table 3. Mercury thermostats recycled, 2003-2006, per thousand population .....	4
Table 4. Thermostats recycled per thousand population in the top ten states and in King County (2005 data).....	4
Table 5. Percent of out-of-service mercury thermostats recycled in King County, 2003-2006 .....	5
Table 6. Mercury thermostats recycled during incentive pilot and one year later, by month .....	8



## SUMMARY

Across the country, thermostats remain one of the largest reservoirs of mercury. In King County, there are an estimated 250,000 mercury thermostats in residential and commercial buildings. When these thermostats come out of service, they must be recycled. Mercury is banned from City of Seattle and King County landfills, and it poses a risk to the environment and human health. Since 2003, the Local Hazardous Waste Management Program in King County has worked to increase the number of mercury thermostats recycled.

Thermostat manufacturers offer an easy way to do this. A non-profit manufacturers' organization, called the Thermostat Recycling Corporation (TRC), collects and recycles out-of-service mercury thermostats through participating heating and cooling equipment suppliers. Since 2003, TRC collection bins have been available at heating and cooling supply outlets, and more recently, with larger contractors and at household hazardous waste facilities. Contractors and residents may drop off used mercury thermostats for no charge. TRC pays shipping and recycling costs. Despite this fact, thermostat recycling rates remain below fifty percent.

Data presented in this report show that:

- ❑ The number of mercury thermostats recycled in King County and Washington State is not increasing;
- ❑ The number of mercury thermostats recycled each year is less than half of the estimated number of out-of-service mercury thermostats. In other words, *more mercury thermostats are thrown away than are recycled*—even though recycling thermostats is free and convenient;
- ❑ The number of mercury thermostats recycled can quickly be increased by motivating technicians with cash, but this increase goes away once the cash incentive is removed;
- ❑ Increasing the number of recycling locations does not necessarily result in more thermostats being recycled;
- ❑ Large numbers of mercury thermostats continue to be sold, both as stand-alone units and as components in heating and cooling equipment.

At least in King County, the barrier to recycling mercury thermostats does not appear to be infrastructure or cost. Currently, there are 59 places in King County where businesses and citizens can recycle thermostats—for free. Despite an increase in the number of these recycling locations, the number of thermostats recycled has actually decreased. The majority of large contractors who have TRC bins in-house have never recycled thermostats using the program. There is no indication that increasing the number of recycling locations will lead to more thermostats recycled.

So, what *does* stand in the way of recycling thermostats? Possibilities include: behavioral conservatism (recycling represents a *new* way of handling thermostats); lack of motivation (recycling mercury thermostats doesn't seem important, significant, or salient); forgetfulness; lack of knowledge that thermostats must be recycled; lack of information about where to recycle thermostats; extra effort involved to save thermostats rather than throw them away; disbelief that there is a legal mandate because the law isn't enforced.

Providing a \$4.00 cash incentive to technicians for each thermostat recycled led to a significant increase in the number of thermostats turned in during a pilot project that ran October 2004 – April 2005. This number fell when the incentive went away. These results suggest that motivation—rather than forgetfulness, lack of knowledge or lack of information—is a key factor. Providing cash may have several effects, including increasing motivation, overcoming reluctance to do something different, and encouraging the extra effort needed to save and recycle thermostats.

Large numbers of mercury thermostats continue to be sold. The majority of out-of-service thermostats are *not* recycled. In the past, adding bins did not result in an increase in thermostats recycled. If the State and the Local Hazardous Waste Management Program in King County are interested keeping mercury out of the environment, new strategies must be developed.

## MERCURY THERMOSTATS RECYCLED: TOTALS

The number of mercury thermostats collected in the Thermostat Recycling Program (TRC) in King County and in other Washington counties dropped in 2006 compared to 2005—despite the fact that more TRC bins were available, the thermostats recycled via HHW facilities were included in the 2006 tallies, and promotion about thermostat recycling continued throughout 2006.

**Table 1. Mercury thermostats recycled via TRC, 2004 – 2006**

Year	King County	Washington (non-King Co)	Total (WA State)
2004	1,129	~200	1,329
2005	2,042	1,218	3,260
2006	1,666	648	2,314

In King County, 376 fewer thermostats were recycled in 2006 compared to 2005, an 18 percent drop. This drop occurred despite the fact that eight more sites had bins in 2006 (Table 2) and more firms returned bins in 2006 (17 compared to 14 in 2005). In counties other than King County, only half as many thermostats were recycled in 2006, compared to 2005, *despite the fact that there were sixteen more TRC sites statewide.*

**Table 2. Numbers of TRC collection sites and thermostats recycled, 2003-2006**

	King County			Washington State			Totals		
	New sites	Cumul sites	T'stats recy'd	New sites	Cumul sites	T'stats recy'd	New sites	Cumul sites	T'stats recy'd
2003-04	27	27	1,120	0	0	200	27	27	1,329
2005	24	51	2,042	7	7	1,218	31	58	3,260
2006	8	59	1,666	16	23	648	24	82	2,314

One possible explanation for this is that a cash incentive was paid for thermostats recycled in King County during a portion of 2005, while no incentive was paid during any part of 2006. This would not explain why the number of thermostats recycled in counties other than King County decreased in 2006.

The recycling rate for mercury thermostats in King County averages one mercury thermostat per thousand population (1.14 per thousand in 2005; 0.9 in 2006). In counties outside King County, thermostats recycled were 0.14 per thousand population in 2006.

**Table 3. Mercury thermostats recycled, 2003-2006, per thousand population**

Year	King County (1,793,583)		Washington, other than King Co (4,494,176)		Total - WA State (6,287,759)	
	<i>Total</i>	<i>Per 1,000</i>	<i>Total</i>	<i>Per 1,000</i>	<i>Total</i>	<i>Per 1,000</i>
2005	2,042	1.14	1,218	0.27	3,260	0.52
2006	1,666	0.93	648	0.14	2,314	0.37

Compared to other states, Washington State (including King County) ranks sixth, with 0.52 thermostats recycled per thousand population (2005 data). King County alone ranks third.

**Table 4. Thermostats recycled per thousand population in the top ten states and in King County (2005 data)**

Minnesota	1.66
Wisconsin	1.20
<b>King County</b>	<b>1.14</b>
Indiana	.92
Maryland	.77
Florida	.73
<b>Washington</b>	<b>.52</b>
Massachusetts	.47
Ohio	.45
Pennsylvania	.41
New Jersey	.33

(State-by-state recycling data are not yet available from the Thermostat Recycling Corporation for 2006, so it's not yet possible to determine whether other states have experienced a similar decrease in thermostats recycled in 2006.)

## MERCURY THERMOSTAT RECYCLING RATES

The total number of out-of-service mercury thermostats is determined by estimating the total number of mercury thermostats in King County and assessing how many of these are removed each year. This number becomes the denominator against which the recycling rate is calculated.

The Local Hazardous Waste Management Program in King County estimates that there are 255,000 mercury thermostats in buildings located in King County (2005). This estimate is based on a 2004 phone survey of King County residences (210,000 mercury thermostats) (<http://www.govlink.org/hazwaste/publications/HHWSurveyReport2004.pdf>) and visual inspections of randomly selected commercial buildings (45,000 mercury thermostats) (<http://www.govlink.org/hazwaste/publications/SumReportHgTstatCommercial.pdf>).

How many are removed each year? Given that a thermostat has a life expectancy of 30 – 50 years, a conservative estimate assumes that 1/50<sup>th</sup> of the mercury thermostats now in King County buildings are removed each year. This would be about 5,000 thermostats (1/50 x 255,000). The actual number is probably higher.

During the past several years, the estimated recycling rate for mercury thermostats has fluctuated, starting with five percent in 2003, when the program started up. The rate rose to forty percent in 2005, when a cash incentive was paid for each thermostat, then fell to 33 percent in 2006.

**Table 5. Percent of out-of-service mercury thermostats recycled in King County, 2003-2006**

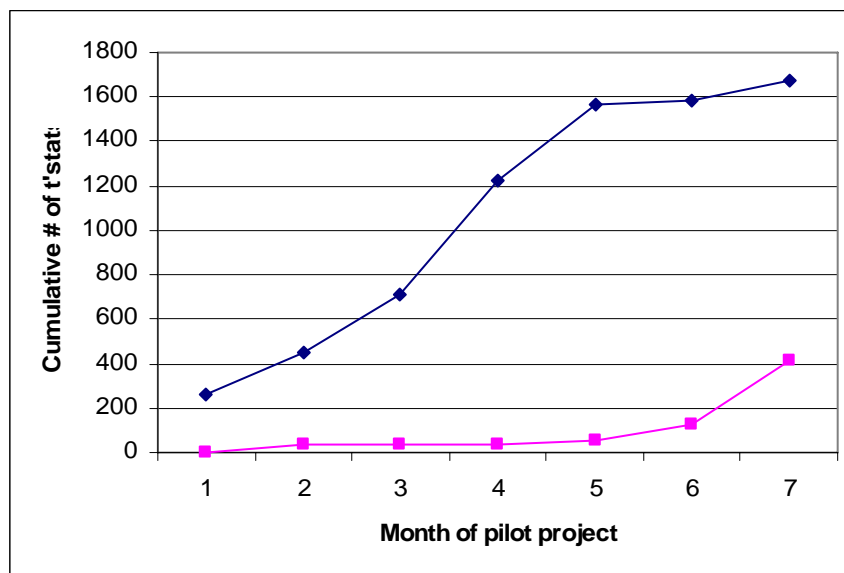
Year	Out-of-service t'stats, total	Number recycled	% recycled
2003	5,000	234	4.7
2004	5,000	1,129	22.6
2005	5,000	2,042	40.1
2006	5,000	1,666	33.3

## EFFECT OF A CASH INCENTIVE

As part of a six-month pilot project, the Local Hazardous Waste Management Program in King County paid HVAC technicians \$4.00 for each mercury thermostat recycled. The rationale was that the ultimate decision about whether an out-of-service mercury thermostat was thrown away or recycled was made by the technicians. Four dollars was assumed to be a sufficient incentive to encourage technicians to recycle the thermostats.

During the pilot project period (Oct 2004 – April 2005), 2,089 mercury thermostats were recycled by the 27 King County suppliers with TRC bins. This is an average 298 thermostats per month. In contrast, an average 170 thermostats per month were recycled in all of 2005 and 138 thermostats per month in 2006. The seven months of the pilot project, straddling 2005 and 2006, clearly showed an increase in the average number of mercury thermostats recycled per month.

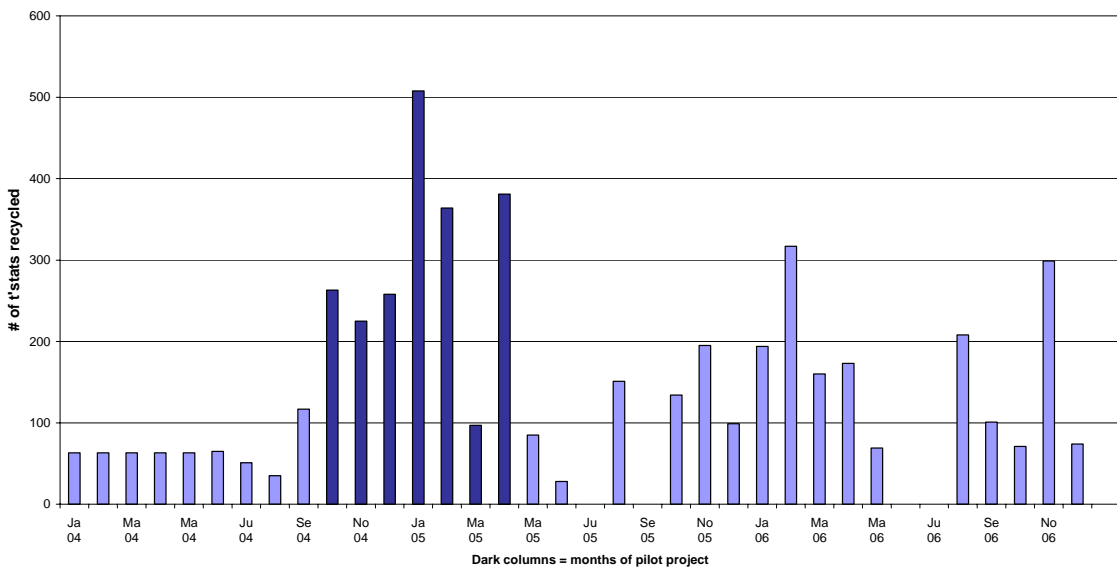
A comparison of the eight suppliers who participated in the pilot incentive project with the 19 suppliers who didn't participate also showed differences (Figure 1). The eight participating suppliers collected a total of 1,676 mercury thermostats during the pilot period, or an average 210 thermostats per participating supplier. This compares to a total 413 thermostats collected by non-participating suppliers, or an average 22 thermostats per non-participating supplier. *Suppliers participating in the cash incentive program collected, on average, ten times more thermostats than suppliers that didn't pay an incentive.* Figure 1 compares thermostats collected by participating and non-participating suppliers.



**Figure 1. Mercury thermostats (cumulative) collected during cash incentive pilot project by participating and non-participating suppliers, 2004-05**

There are a number of reasons why more mercury thermostats were collected during the cash incentive pilot project. They include: technicians recycled thermostats instead of throwing them away; technicians recycled thermostats that had been previously stockpiled; and technicians diverted business to suppliers that paid an incentive for thermostats instead of recycling them at the non-incentive supplier.

Unfortunately, the number of thermostats recycled fell after the incentive pilot ceased—that is, technicians did not continue to recycle as many thermostats when there was no cash incentive (Figure 2). Comparing the number of thermostats recycled during the incentive period (Oct 04 – Apr 05) with the same months one year later, there is a decrease in the number of thermostats recycled for every month but one (Table 5). The average number of thermostats recycled monthly fell from 298 during the incentive period to 182 one year later, a 40 percent drop. This drop occurred despite the fact that there were more TRC bins available in King County during the latter period.



**Figure 2. Mercury thermostats collected in King County by month, Jan 2004- Dec 2006**

**Table 6. Mercury thermostats recycled during incentive pilot and one year later, by month**

<b>Month</b>	<b>Pilot (2004- 05)</b>	<b>One year after pilot (2005 – 06)</b>	<b>Net gain/loss one year after pilot</b>
October	263	134	(129)
November	225	195	(30)
December	258	99	(159)
January	508	194	(314)
February	364	317	(47)
March	97	160	+63
April	381	173	(208)

## SALES OF MERCURY THERMOSTATS

The Interstate Mercury Education and Reduction Clearinghouse (IMERC) Mercury-added Products Database collects data from manufacturers about the mercury used in their products. For 2001, IMERC reported that the total amount of mercury in thermostats sold in the United States amounted to 28,689 pounds, or 14.3 tons. This includes thermostats used in residences, businesses and industrial settings—both as stand-alone units and components within heating and cooling equipment. Pro-rated (by population) to Washington State and King County, this amounts to 573 pounds and 172 pounds of mercury, respectively.

The 172 pounds of mercury estimated (on a pro rata basis) to be in thermostats sold in King County in 2001 amounts to approximately 26,000 thermostats. As noted above, these represent wall thermostats as well as thermostat components in heating and cooling equipment.

Anecdotal data from heating and cooling equipment suppliers suggest that sales of mercury thermostats in the Pacific Northwest are not high. Much new construction in Puget Sound uses baseboard heating, which relies on bi-metallic thermostat switching mechanisms instead of mercury. Accurate sales data are not available.

## CONCLUSIONS AND RECOMMENDATIONS

A number of conclusions can be drawn from the data presented in this report:

- ❑ The number of mercury thermostats recycled is less than half the estimated number of out-of-service mercury thermostats. More mercury thermostats are thrown away than are recycled—even though recycling thermostats is free and convenient.
- ❑ The number of mercury thermostats recycled can quickly be increased by motivating technicians with cash. The increase in recycling goes away, however, once the cash incentive is removed.
- ❑ The number of mercury thermostats recycled does not increase by increasing the number of recycling locations.
- ❑ A significant amount of mercury is still used in manufacturing thermostats nationally. Pro-rated by population, this could mean as many as 26,000 new mercury thermostats are sold annually in King County. Anecdotal data from the Puget Sound region suggests that this number may be inflated. In the absence of actual sales data, the number of new mercury thermostats sold annually in King County isn't known.
- ❑ A critical barrier to recycling thermostats appears to be lack of motivation rather than structural barriers (convenience or cost).

Hundreds of individual technicians remove and dispose of mercury thermostats in King County. Data presented in this report suggest that it will take more than free, convenient collection locations to convince them to recycle these thermostats. King County and the State of Washington have a number of options:

Pay a cash incentive. At \$4 per thermostat, the cost to recycle the estimated 5,000 out-of-service mercury thermostats in King County would be \$20,000 annually, plus staff time necessary to facilitate the program.

Require manufacturers of mercury thermostats to provide a financial incentive for recycling thermostats, as do Maine and Vermont. The mechanism would be state legislation similar to the Maine Thermostat Law or the Product Stewardship Institute's Model Thermostat Legislation.

Enforce the Universal Waste Rule, which provides that mercury thermostats must be recycled or handled as hazardous waste. Create a mechanism for heating contractors to track thermostats recycled and develop an inspection/enforcement mechanism to ensure that this happens.

Use 'disincentives' to discourage heating contractors and their technicians from throwing mercury thermostats away. Publish the names of those who put mercury into the garbage.

Determine what issues or arguments (fish contamination? increased risk of heart disease?) could actually motivate heating contractors/technicians to voluntarily recycle thermostats without a cash incentive. Conduct a large-scale awareness campaign to generate compliance with recycling.

These options are presented as a starting point for discussion as the Local Hazardous Waste Management Program in King County considers how to move forward into the next phase of mercury thermostat management.