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Performance Standards for Mercury Switch Removal from Automobiles at End-Of-Life
***EPA Award* #X198-1676-01**
Final Report

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EXECUTIVE SUMMARY

Many programs have been launched in the U.S. to remove mercury switches from end-of-life automobiles. Because U.S. automobile manufacturers have stated that they cannot provide definitive information concerning the use of mercury convenience light switches and/or ABS brake system by make, model, and year, it has been very difficult to design and implement widespread programs that effectively capture all mercury switches. Consequently, learning which vehicles contain or may contain such switches, how many were installed in each vehicle, and the location of the switches in each make and model requires trial and error on the part of processors of end-of-life vehicles. In order to move beyond this obstacle, this project set out to develop a multi-party negotiated agreement to establish a performance standard for determining if all mercury switches have been removed at the end of a vehicle's life.

Key stakeholder groups that participated in the negotiation included American and Japanese automobile manufacturers, automobile manufacturer trade associations, auto recyclers and auto recycler trade associations, scrap metal trade associations, environmental organizations, and utilities. The process included data collection and analysis, and the development of negotiated protocols for reporting. The project was organized and facilitated by the Northeast Recycling Council, Inc. (NERC), and was funded by the United States Environmental Protection Agency.

Project Goal: To develop a negotiated performance standard that defines the terms of success for an end-of-life mercury switch removal program (convenience lighting and ABS).

This project was **not** concerned with:

- Assigning responsibility for the cost of end-of-life mercury switch removal or management.
- Determining which entities are responsible for developing or implementing end-of-life mercury switch management programs.

Background

In 2001 the Partnership for Mercury Free Vehicles (PMFV), developed model extended producer responsibility legislation for the removal of mercury switches from automobiles at their end-of-life.[1] Subsequently, the State of Maine adopted legislation based on the model. Neither the model nor the enacted legislation included performance standards or a system for measuring the success of a switch removal program. The PMFV was of the position that the lack of comprehensive data about the location of mercury switches was a barrier to the effective implementation of the producer responsibility model. As a result, members of the PMFV approached NERC and asked it to pursue the development of such a standard.

[1] http://www.cleancarcampaign.org/modellegislation.shtml

Data Collection & Analysis

Among the first steps was to form an Advisory Committee to help guide the collection and analysis of data. It was agreed that a lack of basic information about the location of mercury switches by make, model, year and application was an obstacle to the development of a valid target rate for mercury switch removal. It was also agreed that a certain percentage of switches would be inaccessible due to severe collision damage.

In collaboration with the Advisory Committee, NERC developed two principle strategies for overcoming this data gap:

1. Consolidating all existing databases.
2. Collect data on accidents and the condition of vehicles at the end-of-life.

There were two key assumptions underlying this strategy:

1. The data about the location of mercury switches was available but was spread among several sources.
2. The instances of inaccessible switches would be sufficiently significant to impact the number of switches available for collection at the vehicle's end-of-life, and accident data with information about the specific damage done to vehicles is available from the insurance industry, federal highway agency, or other sources.

It was ultimately determined that these assumptions were wrong.

Assumption 1: The data was available: While there was quite a bit of published data, once compiled, organized by manufacturer, model, make, year and application and verified with the automobile manufacturers the result was a very large, unwieldy spreadsheet. The intention had been to format the data into a user-friendly tool that could be used by end-of-life vehicle processors to target vehicles for mercury-switch removal.

Once consolidated it was apparent that the data was overwhelming in its scope and detail and would not be a useful tool. Members of the Advisory Committee who worked in the automobile recycling industry also indicated that most processors do not use computers, that employees would not have the time to stop and check an extensive list to determine which vehicles to examine, and that with the high turn-over rate in employees it would require frequent training with little or no advantage to the business.

Further, despite the exhaustively detailed information that was consolidated, the manufacturers could not say if mercury switches had been used in additional makes and models, or even in additional applications in the vehicles already identified. And, in those vehicles that were identified as having mercury switches not every vehicle of a particular make, model and year would definitely have mercury switches. There were several reasons offered:

1) In-service replacement,

2) Optional equipment, and
3) Lack of information about the presence of mercury in switches provided by third-party suppliers.

In an attempt to make the data useful, it was inverted to catalogue vehicles that were entirely *without* mercury applications, with the hope that the approach might result in the desired guidance tool for end-of-life processors. This approach failed to reveal the level of detail or information that was deemed appropriate to guide someone in attempting to remove a mercury switch. As a result, the Committee determined that in order to develop a performance standard it would be necessary to obtain the following information:

- The percent of vehicles that can be expected to have convenience lighting or ABS mercury switches.
- The average number of convenience lighting mercury switches in each vehicle with such switches.

Thus, rather than the performance standard being an empirical number based on the verifiable occurrence of mercury switches, the performance standard would be expressed as a description rather than a formula; for example, 90% of models prior to model year x has an average of two convenience lighting mercury switches. A statistician was hired to derive this information from the existing data.

After analysis of the data he determined that it would not be possible to answer our questions. Instead, he observed that the *likelihood* of the presence of a mercury switch could be narrowed to a handful of models and years. The statistician described the potential as follows:

- The data is good enough to tell everyone where to start to look. It allows us to say which makes of vehicles in which years probably DON'T have switches.
- We know enough to start collecting switches and measuring performance, and yet the data can't be used to "demand exact" numbers of switches per car.

Assumption 2: The accident data was available: We exhausted every source that was suggested and came up empty-handed. However, the State of Michigan Department of Environmental Quality had done a pilot convenience light mercury-switch removal project that included analyzing the end-of-life condition of the vehicles. That study showed that approximately 5% of vehicles at end-of-life will not have mercury switch applications accessible due to accident damage. The Committee decided that the Michigan study was a credible one and that, as such, the percentage of severely damaged vehicles was too small to matter in the final performance standard. Thus, this criterion was dropped from further consideration as part of the performance standard.

Performance Standard

Because the previously assumed direction of the performance standard had been thwarted, the Committee determined to develop a performance standard strategy based

on a reporting protocol. It was important that the protocol be simple to use for end-of-life processors and that it captured the required data. In addition, the Committee was clear that the protocol needed to include the capacity for processor specific adjustment. For example, if a processor only handled non-U.S. brands, the potential number of switches to recover would be significantly less than a company dealing with older model American vehicles. In addition, it is reasonable to anticipate that over time the number of potential switches will decrease as the pool of vehicles with switches declines. The protocol needed to be flexible enough to adjust to the changing circumstances. Such a protocol was developed but was ultimately never fully supported by the Committee.

The first draft of the protocol was prepared by a Committee member who is an automobile recycler. That document formed the basis of the performance measurement protocol. The protocol evolved to reflect the work of the statistician as well as the increasingly sophisticated thinking of the Committee. Two significant adjustments to early drafts of the protocol were incorporated:

- Limiting the reporting to convenience lighting with the intention of incorporating the ABS mercury switch applications once the document had been more finally developed.

- *NOT* using the specific information developed about the frequency of convenience mercury switches by make, model and year. Instead, using a modified version of the results of the above referenced Michigan pilot study.

These changes were made to keep the protocol as simple as possible to understand and implement. The belief being that this would be an essential pre-requisite for its use by end-of-life processors.

Convenience Lighting Only

ABS switch removal is much harder than convenience lighting switches, and is present in a far more limited pool of vehicles. As a result, the Committee decided to prioritize its initial efforts and to focus on convenience lighting.

NOT Use the Specific Switch Data

This was a more controversial decision. The automobile manufacturers on the Committee expressed the strong belief that the Michigan data should be used rather than the make, model, and year specific information. As a pilot study, they believe that the Michigan data is more accurate than the information that had been provided to date by manufacturers and compiled in various databases. In part this is because of the points noted above about the variables associated with the certainty that a mercury switch would be used in all vehicles within a category. The Michigan study found that overall the average vehicle is likely to have .54 mercury switches.[2] The study was primarily limited to American makes of vehicles.

[2] Id.

However, ".54" would add an unwanted level of complexity to the protocol format because it would require relatively difficult multiplication. The decision was made that since we had moved to an imperfect standard, and one that was more directly based on the specific circumstances of a processor than on an empirical formula, that it would be legitimate to round down to 0 .5.

A further step that is reflected in the form is the use of "1/2" for non-American vehicles. This was a difficult – and not scientific – decision. Since the Committee had rejected the use of the specific data as too complex and the Michigan study didn't have strong data for foreign makes, it was determined to use the ½ figure for those vehicles as well. However, this decision remained challenged by some Committee members.

Testing the Protocol

In order to ensure that the protocol could fulfill its purpose, it was determined to field test it with several end-of-life processors. Committee members were asked to test the protocol, as were two other businesses that had provided outside guidance to the Committee at other stages in the project. In total, four companies were approached, including one "u-pick it" business. All four enterprises refused. Among the reasons were:

- The form is too complicated.
- Why should I? What will I get "out of it"?
- What can I do with the switches once I remove them?

Follow-up phone call interviews were made with each company in an attempt to resolve the barriers. These calls revealed that the document itself was not the obstacle, rather the ongoing question of motivation to take the extra time and trouble and the belief that if there was "a bounty" that "the problem would solve itself." In addition, it was stressed that recordkeeping of any type can be a significant burden if it is not minimized. Undue record keeping is a deterrent to compliance.

While we did not achieve a negotiated agreement for the performance standard, we did achieve consensus on many significant points:

- < 5% of vehicles at end-of-life will not have mercury switches accessible due to accident damage.
- In order to effectively and efficiently measure the success rate for removing convenience lighting mercury switches at the end-of-life, we must know:
  - The percentage of vehicles that can be expected to have convenience lighting mercury switches.
  - The average number of convenience lighting mercury switches in each of these vehicles.
- The spreadsheet of consolidated mercury application data was validated and accepted.
- Consolidated data

In addition, a majority of the interests represented on the Committee agreed with the following points:

- Protocol for measuring, and a
- Statement about switch removal at the end-of-life vs. in-service.

Highlights of Recommendations & Observations

1. There remains a need for comprehensive data about the use of mercury switches by make, model and year.
2. Stakeholders urged that an ISRI standard prohibiting scrap metal with mercury (switches) with a pre-shredder spot check and rejected loads could play an important role in encouraging the removal of mercury switches.
3. Stakeholders in the end-of-life processor industry urged that a per switch bounty, coupled with a program for management of the switches, would result in the removal of all mercury switches.
4. Facilities that handle whole end-of-life vehicles, whether a shredder or a recycling facility of any type, should be the point of focus for mercury switch removal and record keeping due to resource efficiency.
5. It is essential that whatever strategies are designed for end-of-life removal exists within the context of an even playing field.
6. ARA certification program should be amended to include a requirement for the removal of mercury switches from vehicles as part of the standard environmental performance procedures.[3]
7. In some circumstances, NSPDS permits are an effective tool for encouraging the removal of mercury switches.

INTRODUCTION

EPA Headquarters provided funding to the Northeast Recycling Council, Inc. (NERC) to develop a negotiated end-of-life performance standard for the removal of mercury from automobiles.

DELIVERABLES & ACTIVITIES

The table below lists the principle activities and deliverables for this project. Each activity or task is described in more detail below.

[3] The ARA has provided the following comment: "The general feeling in ARA is that mercury switch removal could most likely be included in the certification program if there was an infrastructure in place that would allow for the transportation and disposal within reasonable business parameters. Right now each part of the country has unique problems in dealing with the mercury."

Activities & Deliverables

- Develop Advisory Committee
- Develop Stakeholder Committee
- Regular conference calls with Stakeholder Committee
- Develop a research strategy for baseline data collection
- Data collection & analysis
- Write data report
- Negotiate agreement for mercury switch removal performance standard ("Agreement")
- Quarterly reports
- Post data report & Agreement
- Final Report & Agreement
- Grant administration & oversight

Figure 1: Key Activities & Deliverables

Develop Advisory Committee

The Advisory Committee was formed in October 2002 (Appendix 3). There were two conference calls: December 9, 2002 and January 3, 2003 (Appendix 7). There was also a great deal of email communication. The Advisory Committee initially focused on reviewing the data gathered to date about the presence of mercury applications in vehicles. They were emailed the information and asked to make comments on formatting, accuracy, and recommendations for additional sources of information. The Advisory Committee also helped to develop the list of individuals to invite to participate in the Stakeholder Committee, and helped to craft the letter of invitation to those individuals.

Develop Stakeholder Committee

All of the Advisory Committee members agreed to participate on the Stakeholder Committee. A letter of invitation was sent to the identified potential stakeholder participants in late January. (Appendices 4 & 5) As individuals joined the Stakeholder Committee additional suggestions were made for individuals and organizations to include. Thus, the Stakeholder Committee ultimately had 40 members. (Appendix 6).

Manufacturers	Metal	Dismantlers	Environmental	States	Other
Assoc. of International Auto. Manufacturers (AIAM)	Institute for Scrap Recycling Industries (ISRI)	Assoc. of Auto Recyclers (ARA)	Ecology Center	MA	Coventa Energy
Daimler Chrysler	Steel Recycling Institute (SRI)	NH Auto & Truck Recyclers	EPA	ME	NH Automobile Dealers Assoc.
Ford		Northwest Auto Parts	Great Lakes United	MI	
Honda North America			NEWMOA	NH	
Subaru		Weller Auto Parts	Sustainable Conservation	NY	
General Motors				RI	
				VT	

Figure 2: Stakeholder Committee

Regular conference calls with Stakeholder Committee
Conference calls were held with the Stakeholder Committee on:

- March 11, 2003
- April 22, 2003
- May 27, 2003
- June 25, 2003
- August 7, 2003
- December 1, 2003
- January 21, 2004

Notes from these calls are in Appendix 7.

Develop a research strategy for baseline data collection
The Advisory Committee played a critical role in guiding the data collection. It was agreed that a lack of basic information about the location of mercury switches by make, model, year and application was an obstacle to the development of a valid target rate for mercury switch removal. It was also agreed that a certain percentage of switches would be inaccessible due to severe collision damage.

Thus, in collaboration with the Advisory Committee, NERC developed two principle strategies for overcoming this data gap:

- Consolidate all existing databases with mercury switch application data, and
- Collect data on accidents and the condition of vehicles at the end-of-life.

There were several assumptions underlying this strategy:

- The data was available about the location of mercury switches, but it was spread among several sources.
- The instances of inaccessible switches would be sufficiently significant to impact the number of switches available for collection at the vehicle's end-of-life.
- Accident data with information about the specific damage done to vehicles is available from the insurance industry, federal highway agency, or other sources.

With the assistance of the Advisory Committee, and later the Stakeholder Committee, data sources for the use of mercury switches in vehicles was identified and secured.

Data collection and analysis

The grant proposal had targeted mercury switches and ABS mercury brakes as the point of focus for the project. In the course of gathering data about the location of mercury in vehicles by make, year and model, it became apparent that there are several other applications for mercury in vehicles, and that in some instances – headlamps and entertainment systems for example – it is an increasing area of usage. The Advisory Committee had been interested in ensuring that as complete a record of all mercury applications in vehicles as possible was developed, and thus that strategy that was implemented. The Stakeholder Committee, however, had several members that voiced concern about the concept that this project might be expanded beyond the original scope. This proved to be a topic of lengthy debate within the Committee.

Scope of Project

Because the data clearly demonstrated the use of mercury in non-switch applications there was in-depth discussion about whether to expand the scope of the project. Ultimately it was decided to stay with the original scope but to acknowledge that there are other applications and that they are growing in frequency. However, the amount of mercury these applications individually and potentially totally represent is significantly less than that of mercury switches.

Mercury Switch Data

The data about mercury switch use was compiled into an Excel Spreadsheet and then distributed to individual automobile manufacturers for verification/correction. While there was quite a bit of published data, once compiled, organized by manufacturer, model, make, year, and application and verified with the automobile manufacturers the result was a very large, unwieldy spreadsheet.

The intent had been to format the data into a user-friendly tool that could be used by end-of-life vehicle processors to target vehicles for mercury-switch removal. But once consolidated it was apparent that the data was overwhelming in its scope and detail, and would not be a useful tool. Stakeholder Committee members who worked in the

automobile recycling industry also indicated that most processors do not use computers, that employees would not have the time to stop and check an extensive list to determine which vehicles to examine, and that with the high turn-over rate in employees it would require frequent training with little or no advantage to the business.

Further, despite the exhaustively detailed information that was consolidated, the manufacturers could not say if mercury switches had been used in additional makes and models, or even in additional applications in the vehicles already identified. And, in those vehicles that were identified as having mercury switches, not every vehicle of a particular make, model and year would definitely have mercury switches. There were several reasons offered:

- In-service replacement,
- Optional equipment, and
- Lack of information about the presence of mercury in switches provided by third-party suppliers.

In an attempt to make the data useful, it was inverted to catalogue vehicles that were entirely *without* mercury applications, with the hope that the approach might result in the desired guidance tool for end-of-life processors. This approach failed to reveal the level of detail or information that was deemed appropriate to guide someone in attempting to remove a mercury switch.

As a result, the Committee determined that in order to develop a performance standard it would be necessary to obtain the following information:

- The percent of vehicles that can be expected to have convenience lighting or ABS mercury switches.
- The average number of convenience lighting mercury switches in each vehicle with such switches.

Thus, rather than the performance standard being an empirical number based on the verifiable occurrence of mercury switches, the performance standard would be expressed as a description; for example, 90% of models prior to model year x has an average of two convenience lighting mercury switches. In order to derive this information from the existing data it was decided to engage the services of a statistician.

The Director of the University Of Massachusetts Amherst Center for Statistical Analysis[4] was then engaged to conduct this statistical analysis. Initially he was optimistic that the consolidated data could reveal the desired information. But after more detailed analysis, the answer proved to be “no, we couldn’t” get the answer to our questions from the existing data. Instead, he observed that the *likelihood* of the presence of a mercury switch was focused in a handful of models and years. By consolidating and re-configuring the data, (Appendix 13) the statistician described its potential as follows:

[4] Dr. Michael Sutherland, University of Massachusetts Amherst

- "The data is good enough to tell everyone where to start to look.

- The data allows us to say which makes of vehicles in which years probably DON'T have switches, and to start to collect switches from "suspect" makes, models and years.

- We know enough to start collecting switches and measuring performance, and yet the data can't be used to "demand exact" numbers of switches per car.

- Based on the data we presently have, it is possible to start a flexible, non-prescriptive and adaptive collection system that can "learn" from each end-of-life processor's actual experience.

- Simple plotting of yields by make-model-year is all one needs. This allows for enough flexibility in the system to begin recycling and learning the process without fear of legal or bureaucratic reprimand of any merit. To do this, we start with what we know now and keep track of both a numerator and a denominator - how many vehicles had mercury switches (numerator) out of how many vehicles (denominator) did we see. This would identify each make-model-year suspects "true" switch yield from those records. "

Accident Data
We were unable to secure any primary sources of data about the end-of-life condition of vehicles. It was the Committee's opinion and advice that the recent Michigan Department of Environmental Quality Study adequately addressed that issue by determining that less than 5% of vehicles have inaccessible mercury switches at the end-of-life. The Committee recommended that no further efforts be expended on this point.

Write data report
As discussed above, a spreadsheet data report was developed. It was separated into individual manufacturers and sent to them for verification. For those manufacturers for whom we were unable to secure any data, the trade association representatives have attempted to secure the information for us.

Ultimately, because of the data problems discussed above, we produced two data reports:

- Consolidated data spreadsheet (Appendix 8)
- Consolidate data table (Appendix 13)

Negotiate agreement for mercury switch removal performance standard
The Stakeholder Committee had agreed that the performance standard will define the terms of success for determining when an end-of-life mercury switch removal program has achieved the goal of removing all mercury switches that are present and reasonably accessible. The group agreed that <5% of switches are not recoverable at end-of-life.

While there was no specific performance standard agreed to, it was generally agreed that a majority of recoverable switches should be captured by any switch recovery programs.

Because the previously assumed direction of the performance standard had been thwarted due to the inability of the available data to support that strategy, the Committee determined to develop a performance standard strategy based on a reporting protocol (Appendix 11). It was important that the protocol be simple to use for end-of-life processors and that it captured the required data. In addition, the Committee was clear that the protocol needed to include the capacity for processor specific adjustment. For example, if a processor only handled non-U.S. brands, the potential number of switches to recover would be significantly less than a company dealing with older model American vehicles. In addition, it is reasonable to anticipate that over time the number of potential switches will decrease as the pool of vehicles with switches declines. The protocol needed to be flexible enough to adjust to the changing circumstances.

The first draft of the protocol was prepared by a Committee member who is an automobile recycler. That document has formed the basis of the performance measurement protocol. While not in final form, the protocol has evolved to reflect the work of the statistician as well as the increasingly sophisticated thinking of the Committee. Two significant adjustments to early drafts of the protocol are incorporated in the above draft:

- Limiting the reporting to convenience lighting; with the intention of incorporating the ABS mercury switch applications once the document had been more finally developed.

- *NOT* using the specific information developed about the frequency of convenience mercury switches by make, model and year. Instead, using a modified version of the results of the above referenced Michigan pilot study.

These changes were made to keep the protocol as simple as possible to understand and implement. The belief being that this would be an essential pre-requisite for its use by end-of-life processors.

Convenience Lighting Only

ABS switch removal is much harder than convenience lighting switches, and is present in a far more limited pool of vehicles. As a result, the Committee decided to prioritize its initial efforts and to focus on convenience lighting.

NOT Use the Specific Switch Data

This was a more controversial decision– and one that remains under active Committee discussion. The automobile manufacturers on the Committee expressed the strong belief that the Michigan data should be used rather than the make, model, and year specific information. As a pilot study, they believe that the Michigan data is more accurate than the information that had been provided to date by manufacturers and

compiled in various databases. In part this is because of the points noted above about the variables associated with the certainty that a mercury switch would be used in all vehicles within a category. The Michigan study found that overall the average vehicle is likely to have .54 mercury switches.[5] The study was primarily limited to American makes of vehicles.

However, ".54" would add an unwanted level of complexity to the protocol format because it would require relatively difficult multiplication. The decision was made that since we had moved to an imperfect standard, and one that was more directly based on the specific circumstances of a processor than on an empirical formula, that it would be legitimate to round down to 0 .5.

A further step that is reflected in the form is the use of "1/2" for non-American vehicles. This was a difficult – and not scientific – decision. Since the Committee had rejected the use of the specific data as too complex and the Michigan study didn't have strong data for foreign makes, it was determined to use the ½ figure for those vehicles as well. However, this approach is under challenge by some Committee members.

Testing the Protocol

In order to ensure that the protocol could fulfill its purpose, it was determined to field test it with several end-of-life processors. Naturally, Committee members were asked to test the protocol, as were two other businesses that had provided outside guidance to the Committee at other stages in the project. In total, four companies were approached, including one "u-pick it" business.

To our surprise, all four enterprises refused – including the individual who had originally drafted and supported the protocol. Among the reasons were:

- The form is too complicated.
- Why should I? What will I get "out of it"?
- What can I do with the switches once I remove them?

Follow-up phone call interviews were made with each company in an attempt to resolve the barriers. These calls revealed that the document itself was not the obstacle, rather the ongoing question of motivation to take the extra time and trouble and the belief that if there was "a bounty" that "the problem would solve itself." In addition, it was stressed that recordkeeping of any type can be a significant burden if it is not minimized. Undue record keeping is a deterrent to compliance.

Additionally, one company offered the following detailed comment:
"I am sorry to say that we were unable to test [the protocol] because of the unanswered questions. We needed to know how to fill out the information, how to dispose of the mercury, how to handle the product and evaluate our exposure to risk by holding and shipping this waste material. Simply questions like, do we open the switch to be sure it is a mercury switch for accurate recording purposes, if so, what do we do with the

[5] Id.

capsule, do capsules require special safety handling for the protection of our personnel, all these are reasonable questions that needed to be addressed before we were comfortable with what we were doing at an operational level.

Other larger questions had to be addressed as well. Of particular interest was the need for clarification as to how the test data would be used. We were very concerned that we would do the limited testing and then the results would be used as if they were definitive. If the results were used as a basis for legislative quantification bench marks that could be devastating to us since we know the results are limited and suspect."

In-service switch removal debate

Early in the project, the Committee had taken a consensus position that "facilities that handle whole end-of-life vehicles, whether it's a shredder or a recycling facility of any type should be the point of focus for mercury switch removal and record keeping." Recently, this position was challenged by a Committee member who is involved in the end-of-life management of vehicles; rather, in-service removal should be the emphasis. The Committee rejected this modification but did agree to amend its language to include in-service removal (not replacement) as an appropriate strategy in addition to end-of-life management.

The substantive recommendation that resulted was to modify the protocol in order to account for vehicles that have had mercury switches removed in-service. How this might be accomplished has not been discussed, but the concept received broad support within the Committee.

While we did not achieve a negotiated agreement for the performance standard, we did achieve consensus on many significant points:

- < 5% of vehicles at end-of-life will not have mercury switches accessible due to accident damage.
- In order to effectively and efficiently measure the success rate for removing convenience lighting mercury switches at the end-of-life, we must know:
  - The percentage of vehicles that can be expected to have convenience lighting mercury switches.
  - The average number of convenience lighting mercury switches in each of these vehicles.
- The spreadsheet of consolidated mercury application data was validated and accepted.
- Consolidated data

In addition, a majority of the interests represented on the Committee agreed with the following points:

- Protocol for measuring
- Statement re: end-of-life vs. in service

Other

Lynn Rubinstein participated in the MN OEA product stewardship meeting in Ann Arbor, MI, and provided comments on the draft report on mercury in vehicles. In addition she wrote and presented a paper about this project at the 4th International Automobile Recycling Congress. (Appendices 14 & 15).

RECOMMENDATIONS & OBSERVATIONS

8. There remains a need for comprehensive data about the use of mercury switches by make, model and year.
9. Stakeholder members urged that an ISRI standard prohibiting scrap metal with mercury (switches) with a pre-shredder spot check and rejected loads could play an important role in encouraging the removal of mercury switches.
10. Stakeholders in the end-of-life processor industry urged that a per switch bounty, coupled with a program for management of the switches, would result in the removal of all mercury switches.
11. There is an increasing use of mercury-based applications in vehicles; including by manufacturers that never previously used mercury. These include HID lamps, entertainment, navigational, and other lighting displays. There should be an effort made to eliminate the use of all mercury from vehicles and proper end-of-life management of all mercury-based applications.
12. Facilities that handle whole end-of-life vehicles, whether it's a shredder or a recycling facility of any type, should be the point of focus for mercury switch removal and record keeping due to resource efficiency. However, in-service removal (rather than replacement) of mercury switches, when possible, provides another significant opportunity for mercury switch capture from vehicles.
13. While end-of-life removal of mercury switches is the most cost-effective, programs to remove in-service should be encouraged. It is important that it be removal rather than in-service replacement of like parts.
14. The required removal of mercury switches pre-sale of a used vehicle was deemed to be another important strategy, but one that has yet to garner political support.
15. The scope of the use of mercury switches in replacement parts and after-market applications is unknown and should be a topic of research.
16. It is essential that whatever strategies are designed for end-of-life removal exists within the context of an "even playing field." It was noted that the automotive end-of-life processing industry is one made up primarily of small, marginal businesses. These businesses tend not to be member of trade associations and may be not be as fully aware of or compliant with environmental standards as the larger enterprises. This presents a significant challenge to the focus on end-of-life management of mercury switches.
17. ARA certification program should be amended to include a requirement for the removal of mercury switches from vehicles as part of the standard environmental performance procedures.[6]

[6] The ARA has provided the following comment: "The general feeling in ARA is that mercury switch removal could most likely be included in the certification program if there was an infrastructure in place

18. In some circumstances, NSPDS permits are an effective tool for encouraging the removal of mercury switches.

that would allow for the transportation and disposal within reasonable business parameters. Right now each part of the country has unique problems in dealing with the mercury."