

**TI 251A** Reference Weights

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## **1. PURPOSE AND APPLICABILITY**

The purpose of this SOP is to describe how the microbalances in the sample handling laboratory are calibrated and how reference weights are used to monitor balance measurements.

## **2. SUMMARY OF METHOD**

Microbalances in the sample handling laboratory are manually calibrated once a day, in the morning, before routine weighing can begin. External test weights are measured three times a day. RH and temperature values are recorded every fifteen minutes on a terminal server. Lab blanks and sampled "test" filters are weighed once a week.

## **3. CAUTIONS**

Be careful when handling external test weights, lab blanks, and sampled reference filters. Dropping and/or damaging these can change their weight measurements significantly, creating a discontinuity in the data. Report any drops or filter tears while weighing the lab blanks and sampled reference filters, as they do not have replacements.

## **4. PERSONNEL QUALIFICATIONS**

Trained laboratory technicians are the only personnel who perform calibrations and external test weights.

## **5. EQUIPMENT AND SUPPLIES**

- Microbalances
- Computers with Improve Filter Processing application
- Metal calibration standards (100mg, 50mg)
- Forceps with ceramic tips
- 10 laboratory blanks (labeled C001 - C010)
- 4 sampled reference filters (labeled E,F,G, and H)

## **6. PROCEDURE**

### *6.1 Mettler XP6 Balance Calibration Information*

When the Mettler XP6 microbalance is calibrated, it generates a 3-point calibration equation using two internal masses. The weights of these internal masses combined are in the range of 5-6 grams. The balance will then perform a 2-point test of the calibration equation, showing temperature (°C), nominal percentage (always 100.00000% accuracy), reported accuracy (must be between 99.9998 and 100.00002), and difference (must be 0.00002% or less).

Balance adjustment history can be found locally on the balance by navigating through

“Setting> System> Adjust/Test> Test History-Define > Adjustment History-Show.”

There are a variety of ProFACT adjustments available on the Mettler XP6 balance, but the only one activated on the balances in the sample handling laboratory is ProFACT Auto-Zero. This allows the balance to automatically tare for minute deviations away from zero.

Static may cause the balance not to zero. In this case, tare the balance, wait for a zero weight to stabilize, and then check the External Test Weights using the procedures described in section 6.3.

Do not weigh filters while the gauss meter shows a change in the magnetic field. It is typical to wait 5-15 minutes after a change in the gauss meter to ensure a stable weighing environment before resuming work at the balance.

There are guides on the pan for centering the filters and standards; make sure to use them.

When the balances are calibrated by a Mettler technician, the internal calibration masses are compared against Mettler’s own traceable external calibration weights. Essentially, the yearly calibration is an adjustment of the balance electronics.

#### *6.2 Balance Calibration Procedure*

- 1) Perform calibrations in the morning prior to test weights and routine weighing. Check that the balance is level by making sure the bubble is within the circle on the top of the balance. Also check to be sure that the balance reads zero before beginning. If the balance is out of alignment, level the balance by adjusting the two barrel-adjusters in the back.
- 2) Zero the balance by pressing “→0←”, and then tare the balance by pressing “→T←”.
- 3) To begin, press the “Internal Adjustment” button on the bottom left of the balance screen. This takes several moments.
- 4) When the internal adjustment has finished, press OK to exit.
- 5) Press the “Internal Test” button. The internal test takes several moments.
- 6) Note the nominal value, actual value, and difference, which will all be displayed on the screen. If the difference is greater than  $\pm 0.00002\%$ , confirm gauss meter stability and repeat the internal calibration and test. If the gauss meter does not stabilize, check with the cyclotron operators.
- 7) If three repeated internal calibrations do not meet the criteria and the gauss meter is stable, “exercise” the balance by weighing a 2-5 grams mass on the balance several times. Then, repeat the internal calibration.
- 8) If the balance will not pass internal test tolerances after performing the steps above, contact a Mettler technician.

#### *6.3 Stainless Steel External Test Weights*

External test weights are weighed three times a day; at around 8:15am after balance calibrations, at noon, and at 4pm.

Through these external tests, it is possible to track balance consistency throughout the day. These external tests show that the balances will maintain a reliable balance equation

throughout the day.

- 1) It is advisable to start on Mettler 2. Open the Improve Filter Processing program. Navigate through Admin > Balance quality control > Weight reference filter. In the pop-up box, enter 3-letter user initials. Confirm that "Pick type" is set to "Metal test weight". Under "Pick weight", select 100#, where # identifies the test weight.
- 2) Start the balance by pressing "START SCALE (F5)" at the top. Wait several seconds, and the program will display a prompt "Scale zeroed". Put weight in scale.
- 3) Keeping the wrist in within the ionizing zone, pass the 100mg weight through the ionizing unit and place it on the balance to wait for a stable reading. Confirm that the head-unit display's characters are in black, that the number matches the application reading with a green background, and that it also matches the suggested weight in the text to the right. If all three numbers do not match, press "R" to refresh. When the application suggests the correct stable weight, press "A" to accept.
- 4) Confirm the entries for Initials, Time, and Recorded weight. Enter the Gauss reading. Record relevant notes in the text box, then press "WEIGHT ANOTHER (F8)".
- 5) Remove the test weight.
- 6) Confirm that "Pick type" is set to "Metal test weight" and repeat steps 2-3 for the 50# test weight under "Pick weight".
- 7) Confirm the entries for Initials, Time, and Recorded weight. Enter the Gauss reading. Record relevant notes in the text box, then press "DONE (F9)".
- 8) Repeat steps 1-7 on Mettler 1.
- 9) If one external test mass weighs 0.003mg or more outside of the expected average (Nominal mass), reweigh that mass. If one external test mass continues to weigh  $\pm 0.003$ mg or more different than the average, test it on the other balance to see if it agrees.
- 10) If one or more weights are out of range on only one balance, re-run internal adjustment and test procedures.
- 11) If both balances agree that one external test weight is out of range, consider sending that weight back for recertification and replace it with a different weight.
- 12) Through these external tests, consistency between balances can be tracked. Each mass should weigh within 0.003mg when compared between balances. If this test fails, reweigh that mass on each balance. If one or more of the masses still disagree, this indicates straying balance equations. Note historical averages for each mass for each balance, and internally recalibrate the balance that shows the most inconsistency or drifting average. If repeated internal calibrations of one balance do not fix the problem, attempt internal adjustment on the other balance.
- 13) If repeated internal calibrations fail and the balance equations do not match, consider contacting a Mettler technician. If both balance equations disagree, most likely both weights will not weigh consistently between balances. Monitoring of the 50mg weight (which is in the range of Teflon® filter weights) is more critical.
- 14) Each 50mg and 100mg mass is recertified yearly to compare balance equations to traceable standards.

#### *6.4 Blank Reference Filters*

Ten unsampled filters are weighed once a week (first business day of the week) for each balance. The filters are in a sealed bag, located in the cupboard where the calibration standards are kept. They are in Petri dishes labeled C001-C010.

- 1) It is advisable to start on Mettler 2. Open the Improve Filter Processing program. Navigate through Admin > Balance quality control > Weight reference filter. In the pop-up box, enter 3-letter user initials. Change "Pick type to "Blank Filter". Under "Pick weight", select C001.
- 2) Start the balance by pressing "START SCALE (F5)" at the top. Wait several seconds, and the program will display a prompt "Scale zeroed". Put filter in scale.
- 3) Keeping the wrist in within the ionizing zone, pass C001 through the ionizing unit and place it on the balance to wait for a stable reading. Confirm that the head-unit display's characters are in black, that the number matches the application reading with a green background, and that it also matches the suggested weight in the text to the right. If all three numbers do not match, press "R" to refresh. When the application suggests the correct stable weight, press "A" to accept.
- 4) Confirm the entries for Initials, Time, and Recorded weight. Enter the Gauss reading. Record relevant notes in the text box, then press "WEIGHT ANOTHER (F8)".
- 5) Remove the test filter.
- 6) Confirm that "Pick type" is set to "Blank Filter" and repeat steps 2-5 for the filters C002 – C010 under "Pick weight".
- 7) After accepting the weight for filter C010, press "DONE (F9)".
- 8) Repeat steps 1-7 on Mettler 1.

#### *6.5 Sampled Reference Filters*

Four filters that have undergone special sampling are weighed once a week (first business day of the week). The filters are in a sealed bag, located in the cupboard where the calibration standards are kept. They are in Petri dishes labeled "E," "F," "G," and "H."

- 1) It is advisable to start on Mettler 2. Open the Improve Filter Processing program. Navigate through Admin > Balance quality control > Weight reference filter. In the pop-up box, enter 3-letter user initials. Change "Pick type to "Loaded Filter". Under "Pick weight", select "E".
- 2) Start the balance by pressing "START SCALE (F5)" at the top. Wait several seconds, and the program will display a prompt "Scale zeroed". Put filter in scale.
- 3) Keeping the wrist in within the ionizing zone, pass filter "E" through the ionizing unit and place it on the balance to wait for a stable reading. Confirm that the head-unit display's characters are in black, that the number matches the application reading with a green background, and that it also matches the suggested weight in the text to the right. If all three numbers do not match, press "R" to refresh. When the application suggests the correct stable weight, press "A" to accept.

- 4) Confirm the entries for Initials, Time, and Recorded weight. Enter the Gauss reading. Record relevant notes in the text box, then press "WEIGHT ANOTHER (F8)".
- 5) Remove the test filter.
- 6) Confirm that "Pick type" is set to "Loaded Filter" and repeat steps 2-5 for the filters "F", "G", and "H" under "Pick weight".
- 7) After accepting the weight for filter "H", press "DONE (F9)".
- 8) Repeat steps 1-7 on Mettler 1.

## 7.0 DATA AND RECORDS MANAGEMENT

The 100mg and 50 mg weights data is stored in SQL. Test weight and reference filter data can reviewed by selecting the "Test Weights and Blanks Report" link from Reporting Services (<http://cl-sql/Reports/Pages/Folder.aspx?ItemPath=%2fIMPROVE+Reports%2fFilter+Processing&ViewMode=List>)

## 8.0 QUALITY ASSURANCE

Test weights and filters are monitored by laboratory staff in order to ensure that the balances are both accurate and precise in their measurements. If laboratory personnel notice a consistent, significant change in weight for a calibration standard, the standard is sent for recertification and an alternate calibration standard is introduced. Any holes or tears in the Teflon® test filters are noted.

Every six months, test weight and test filter nominal masses must be updated.

- 1) Using Reporting Services, calculate the most recent three-month average for each weight or filter.
- 2) Open the Improve Filter Processing program and navigate through Admin > Balance quality control > Manage weights. In the pop-up box, enter 3-letter user initials.
- 3) Under the drop-down menu at the upper-left, confirm "Metal test weight" is selected.
- 4) Select "RECERTIFY" for ID 50# and confirm "Metal test weight" is selected for "Type".
- 5) Fill in "ID" and "Nominal mass". In the "Notes" text box, record the serial number if applicable, and state the date range for the new nominal-mass average.
- 6) After reviewing changes, press "Submit".
- 7) Repeat steps 3-6 for any remaining test weights or filters, changing from "Metal test weight", "Blank filter", or "Loaded filter" as necessary.
- 8) If replacing a test weight or filter, first archive the ID by pressing "Deprecate". Then press "Add New" and repeat step 5.
- 9) When restoring or recertifying an archived weight or filter, check the "Show deprecated" box and repeat steps 3-6, , changing from "Metal test weight", "Blank filter", or "Loaded filter" as necessary.

**TI 251B** Lab Blanks

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## **1. PURPOSE AND APPLICABILITY**

The purpose of this SOP is to describe the procedures used to weigh lab blanks in the sample handling laboratory. Lab blanks filters are important to the IMPROVE operation because they provide a practical approach to monitoring balance performance. The exact same media is used for lab blank filters as is used for those that go out into the field, so the behavior of these filters should be comparable to network filters. Also, IMPROVE network filters are typically pre-weighed on one balance (Mettler 2) and post-weighed on another (Mettler 1); by weighing filters on both balances, it is possible to confirm that both balances have equivalent equations. This ensures that weights are not skewed by using alternate balances at different points of the process. The results of lab blanks confirm that the balance equations remain relatively constant over time, as lab blank filter post weights are usually very close to their pre weights.

## **2. SUMMARY OF THE METHOD**

A pair of lab blanks is weighed two times a week, once on the first business day of the week morning and again two business days later. One of the filters is a clean filter that is prepared before the morning weighing, and the other filter has been pre-weighed and stored. Lab blank filters are weighed on both balances each time.

## **3. CAUTIONS**

It is important not to damage or contaminate the lab blanks in any way. Dropping a filter on a work surface or tearing a hole in the membrane may cause the Teflon® filter to weigh significantly more or less than it otherwise would; thus, it would not be a true representation of balance performance. Any incidents that occur must be noted in the comments field.

## **4. INTERFERENCES**

A change in the gauss will affect the balance reading. If a change in the gauss occurs during weighing lab blanks, wait for the gauss to stabilize and then re-weigh the filter to ensure that an accurate value is recorded and note this in the comments field.

## **5. EQUIPMENT AND SUPPLIES**

- 14 filter cassettes with small red caps to cover the top
- Yellow circular stickers
- 14 red caps for cassette bottoms
- Forceps with ceramic tips
- Microbalances
- Computers attached to each balance, with Improve Filter Processing program
- Ionizing units
- Pen



- Current-lot Teflon® filters

## 6. PERSONNEL QUALIFICATIONS

Laboratory technicians are the only personnel who weigh lab blanks. Lab techs must have been trained by an experienced lab tech and must have read the SOP for lab blank procedures.

## 7. PROCEDURES

### *7.1 Circulation of Lab Blanks*

A pair of lab blanks (a PRE lab blank and a POST lab blank) is weighed twice a week, once on the first business day of the week and again business days later. A lab technician prepares lab blanks after calibration and test weights have been performed.

The PRE lab blank is a brand-new filter from the current Teflon® lot being used for production filters. It must be free of any visible blemishes. Filters are labeled with the letters “LB,” followed by the eight numbers making up the date (formatted YYYYMMDD). After the filter has been used as a PRE lab blank for one day, the filter is placed into a cassette and stored in a black tray. The tray is oriented so that more-recent dates are on the left, with descending dates to the right.

After weighing, the PRE lab blank is placed in the top left of the tray. The order of rotation is youngest to oldest, from left to right. Once four weeks pass, the former PRE lab blank is removed from its cassette and becomes a new POST lab blank. New POST lab blanks are taken from the far top right (the position where the oldest cassette is located). After use as a POST control, the filter is placed in the bottom left of the black tray. Eventually, that filter is taken out of rotation and placed in the “dropped filters” container.

### *7.2 Identifying the POST Lab Blank*

Retrieve the top right cassette, labeled with the oldest date of the top row.

### *7.3 Preparing the PRE Lab Blank*

1. Retrieve the bottom right cassette of the bottom row, labeled with the oldest date.
2. Discard the label from the cassette and transfer the filter to the “dropped filters” container.
3. Find a new, undamaged filter from a clean box of current-lot Teflon® filters.
4. Using ceramic-tipped forceps, place the new filter in the empty, unlabeled cassette; this is the new PRE control.
5. Find a new yellow circular sticker. Label the sticker with the letters “LB,” followed by the eight numbers making up the date (formatted YYYYMMDD). Use this sticker as the new PRE lab blank label and place it on the unlabeled cassette. The PRE and POST lab blanks are now

ready for measurement.

#### *7.4 Conducting Control Measurements: Background Information*

The PRE lab blanks must be replaced twice a week. Lab blanks must be measured after the balance calibrations and test weights are completed in the morning. No network filters are weighed before lab blanks are performed in the morning.

It is advisable to weigh lab blanks on Mettler 2 before on Mettler 1. Be careful not to damage the lab blanks. Before weighing any of the lab blanks, pass them through the ionizing unit with forceps to remove any static that could affect filter weight.

#### *7.5 Lab Blank Measurements Procedure*

1. Obtain the new PRE and POST lab blanks filters (Sections 7.2 and 7.3).
2. It is advisable to start on Mettler 2. Open the Improve Filter Processing program. Navigate through Admin > Balance quality control > Weight lab blanks. In the pop-up box, enter 3-letter user initials. Select the second option "NEW WEIGHT (F3)".
3. Ensure that the PRE lab blanks filter label on the cassette slide matches the ID on the screen.
4. Start the balance by pressing "START SCALE (F5)" at the top. Wait several seconds, and the program will display a prompt "Scale zeroed". Put filter in scale.
5. Keeping the wrist in within the ionizing zone, pass the PRE lab blank through the ionizing unit and place it on the balance to wait for a stable reading. Confirm that the head-unit display's characters are in black, that the number matches the application reading with a green background, and that it also matches the suggested weight in the text to the right. If all three numbers do not match, press "R" to refresh. When the application suggests the correct stable weight, press "A" to accept.
6. Confirm the entries for ID, Date, and Certified weight (recorded weight). Enter the Gauss reading. Record relevant notes in the text box, then press "WEIGHT ANOTHER (F8)".
7. Remove the PRE lab blank.
8. Change the ID on the dropdown to the current POST lab blank. Start the balance by pressing "START SCALE (F5)" at the top. Wait several seconds, and the program will display a prompt "Scale zeroed. Put filter in scale".
9. Keeping the wrist in within the ionizing zone, pass the POST lab blank through the ionizing unit and place it on the balance to wait for a stable reading. Confirm that the head-unit display's characters are in black, that the number matches the application reading with a green background, and that it also matches the suggested weight in the text to the right. If all three numbers do not match, press "R" to refresh. When the application suggests the correct stable weight, press "A" to accept.
10. The difference between the original PRE weight and the POST weight (weight that is currently being taken) for the POST control filter is listed on the table. A difference of  $\pm 0.003$  or less is desired, but if the difference is larger, accept the weight anyway. Lab blank filters are not to be re-weighed unless an unannounced change in the magnetic field occurs during the weighing process or the weight difference seems unreasonably large ( $\pm 0.010\text{mg}$ ). If either of these events occurs, re-weigh the filter on both balances once conditions are

stable and record the corrections in the Notes box.

11. Confirm the entries for ID and Certified weight (recorded weight). Enter the Gauss reading. Record relevant notes in the text box, then press "DONE (F9)".
12. Repeats steps 2-11 on Mettler 1.

## **8.0 DATA AND RECORDS MANAGEMENT**

Lab blank data can reviewed by selecting the "Test Weights and Blanks Report" link from Reporting Services (<http://cl-sql/Reports/Pages/Folder.aspx?ItemPath=%2fIMPROVE+Reports%2fFilter+Processing&ViewMode=List>).

## **9.0 QUALITY ASSURANCE AND QUALITY CONTROL**

Lab blanks are monitored by laboratory staff in order to ensure that the balances are both accurate and precise in their measurements. Several checks are provided when weighing POST lab blanks. When weighing POST lab blanks, the differences between the weights taken previously appear on the table. If filter differences are significant, that could mean that the wrong filter is being weighed or conditions in the lab caused a bad weight to be taken. Any weights considered invalid should be noted in Notes box.

Lab blank filters are kept in the archive row of the tray for three weeks in case of any potential POST filter mix-up. Filters can be retrieved and reweighed as necessary during that time.

**TI 251C Filter Inventory and Acceptance**

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## **1. PURPOSE AND APPLICABILITY**

The purpose of this SOP is to describe the process of acceptance testing and inventorying for the Teflon®, nylon, and quartz filters. The procedures described apply to all filters used for IMPROVE sampling.

## **2. SUMMARY OF THE METHOD**

Teflon® and nylon filters undergo preliminary testing before lots are delivered. When lots are delivered, acceptance testing is performed before the filters are cleared to be loaded and sent out into the field. Quartz testing is done by the quartz contractor before being sent to the gravimetric laboratory. All filter types have inventory sheets that are used to track usage and to estimate when a new lot must be ordered.

## **3. CAUTIONS**

Be sure to track filter inventory carefully and to order filter shipments well in advance (six months or more) to accommodate any delays in the delivery process.

Be very careful when performing acceptance testing and interpreting results. The quality of the filters is important to sampling and analysis.

## **4. EQUIPMENT AND SUPPLIES**

See individual sections for detailed equipment lists for the tasks involved in filter acceptance and inventory.

## **5. PERSONNEL QUALIFICATIONS**

Laboratory technicians or principal investigators can carry out filter acceptance and inventory procedures. Lab technicians must be trained by a PI or another lab technician familiar with the procedures before performing these tasks.

## **6. PROCEDURES**

### *6.1 Teflon® Filters*

#### 6.1.1 Receiving a Teflon® Filter Lot

Teflon® filters are sent directly from Pall Corporation to Crocker Nuclear Laboratory (CNL). Shipments of Teflon® filters are sent with an invoice and a packing slip. Shipments can range from two boxes of filters to as many as 1100 boxes (enough for a year); each box contains 50 Teflon® filters. Test lot shipments will usually contain two boxes, while approved lot shipments will usually contain the full number of boxes used for the year

(~1100). Sometimes lot shipments are split and sent within a day or two of each other. When filters are received, count the number of boxes present in order to verify the packing slip. Sign and date the packing slip and give it to the CNL employee in charge of accounting.

The received Teflon® filter boxes are placed in a large container (ex., Bankers box) and stored in the bookcase by the balances in the lab and in the Annex Lab

#### 6.1.2 Teflon® Filter Inventory

The Teflon® filter inventory files are located in "U:\IMPROVE\_Lab\Lab\_Gravimetric\Filter Inventory. There is a separate folder for each year. Within each yearly folder are separate Excel files for nylon, quartz, and Teflon® filters.

Each Excel file contains numerous spreadsheets for logging in sets of boxes of filters. These sheets are created when a shipment of filters arrives and are completed as filters are used. A printed copy of each log sheet is supplied to the lab staff so they can add entries as the filters are used.

There is also a "RATE LOG" sheet that keeps track of filter usage and provides an estimated depletion date for the filters on hand. The Teflon® files also include "LABELS" sheets that are used to create and print labels to be affixed to each box of filters.

Teflon® filters come in large shipments, typically around a year's supply. A new set of log sheets and a set of labels to affix to each box of filters need to be created for each new shipment.

Open the most recent Excel file for the Teflon® filters and rename it with the date of receipt of the shipment. Some cutting and pasting is needed to create the new file, and enough sheets must be created within the file to accommodate the size of the new shipment.

- 1) Highlight all sheets of interest (sheets beginning with "SHEET") holding "SHIFT" and selecting the first and then last sheet. Viewing any of the selected sheets, select all fields from (J8) to (K32) and press "Delete." This same change should be reflected on all sheets, deleting any pre-filled "INITIALS" and "DATE" entries.
- 2) Note the Part Number on a box of filters, following "P/N." The filter diameter, 25 mm, should not change.
- 3) Note the Lot Number on a box of filters, following "Membrane B#". Example: B2382156-12. The lot number is typically the same for every box in the shipment.
- 4) Note the day these filters were received.
- 5) Again, with all "SHEET" sheets selected, type the Part Number into field B8, the Lot Number in field E8, and the Date Received in I8. This same change should fill the entire columns and be reflected on all sheets.
- 6) Confirm on the box that the "REMOVAL" is 3.0µm and the "Size" is 25mm.

The "Box #" is determined by the set of labels created for each shipment. One label is affixed to each box. The numbers on the labels become IMPROVE's internal pack (or box) numbers. Detailed instructions on creating labels are further below. List the box numbers

consecutively in the "Box #" column of the spreadsheet, 25 to a page. The next column to the left, "Quantity," lists the number of filters in a box. This number is typically 50 for Teflon® filters. However, some filters are removed from a few boxes for acceptance testing or other tests, so modify the numbers in those cells to reflect the actual number of filters in each box. Note this by inserting a comment (right-click, "Insert Comment") for that field. The Teflon® spreadsheet has a "SHIPMENT" column, which is usually "1" unless the order is split or delivered in separate shipments.

A set of labels to be affixed to each box of filters must be created. Go to the "LABELS" sheet to do this. There may be multiple "LABELS" sheets to accommodate the size of the shipment, especially for Teflon® filters. In most cases, only cell B2 (lot number) and E1 (shipment date) needs to be modified. Modify B3 and E3 as well if it is not shipment #1. All of the other cells in the sheet are linked to these upper-left cells and will populate themselves automatically. Print the label sheets onto label stock and affix a label to each box of filters.

A few filters selected from each new lot will need to undergo acceptance testing. Work with the laboratory manager to select these filters and to arrange for laboratory analysis.

The Teflon® Excel file contains a "RATE LOG" sheet. This sheet keeps track of the filter usage versus the inventory available and, based on the average rate of usage, predicts when the current lot will run out. Edit the "RATE LOG" sheet as needed to contain the same number of rows as the number of spreadsheets in the shipment. Note that columns C ("PACKAGES") through G ("COMPLETED") are populated by links to the individual spreadsheets. When a new "RATE LOG" sheet is created, review it carefully to make sure the links are pointing to the proper sheets based on "SHIPMENT" and "SET" listed in columns A and B. Referring to the summary formulas at the bottom of the spreadsheet, the "TOTAL" summation should include all the rows of the table, as it shows the total beginning inventory. The "FIL USED" and "AVG" formulas include only the rows associated with the filters used to date, as will be explained further below. Ignore columns to the right of column H.

The laboratory staff will complete an entry on the printed log sheet each time a box of filters is used. When each sheet is completed, enter these data into the spreadsheets in the Excel files.

Enter the "INITIALS" and "DATE" into each cell on the appropriate sheet.

Proceed to the "RATE LOG" sheet. In cell H3, enter the date on which the log sheet was completed. Check the last completed row in the "RATE LOG" sheet to verify that it corresponds to the log sheet being entered (that row will have been completed by its links to the log sheet). Then go to the formulas at the bottom of the spreadsheet. In both "FIL USED" and "AVG," change the second cell within the formula parentheses to indicate the row of the log sheet being added. If a single log sheet is being added, this will involve augmenting the formula by one row (for example, changing (D6:D17) to (D6:D18)).

Now that all of the data are entered, check the depletion date shown in yellow at the bottom of column H. This date is the estimate of when the inventory will run out based on average usage.

#### 6.1.3 Teflon® Filter Acceptance Testing

Consistency in flow rate and composition (i.e., no contamination) are primary requirements for Teflon® filters being used in the IMPROVE network.

Pall Corporation Teflon® filters are purchased by UC Davis in boxes of 50 filters. Historically, two boxes are received for acceptance testing. Ten filters from each box are analyzed by XRF for composition, and another ten filters from each box are tested for flow changes. When certified, the entire lot is authorized for use in network operations. Acceptance testing is performed again when the filter lot is delivered before they are cleared to go out into the field. The following sections apply to the preparation and analysis of both new test lots of filters and filters that have been pre-approved. Items that apply specifically to only one or the other are noted.

#### *6.1.3.1 Teflon® Analysis*

Twenty filters (ten from each pre-delivery box for preliminary testing) are analyzed by XRF to verify that there are no abnormal artifacts. Once the filters have been analyzed, the average net intensities (cps/mA) and standard deviations are determined for each species. The results of these filters are compared with both the results from the testing of the lot currently in use. If the measured net intensities (cps/mA) for the two lots are within the set acceptance limit, which is the average +3 standard deviations of measured net intensities, then the filters are accepted for full delivery. If, in any case, an outlier or irregularity is observed from visual inspection of the filters and/or the results of the XRF, the laboratory manager is informed.

Once the shipment of the new lot has been received, forty filters (randomly chosen from various boxes), are analyzed by XRF for final check. The results of these filters should meet the same acceptance limits set for the pre-delivery box. All results and comparisons should then be forwarded to the laboratory manager for a final decision about acceptance or rejection of the specific lot of filters.

#### *6.1.3.2 Special Tests for New Teflon® Test Lots*

Once a test lot is shown to have no significant contamination, a test to examine flow change must be performed.

#### *6.1.3.3 Flow Change Test*

A flow change test is done to simulate the change in flow rate that should be expected when the new filter lot is installed in samplers that were calibrated using filters from the current filter lot. A significant change in the flow rate must be avoided as it may result in invalid data.

##### *1) Supplies needed:*

- Three IMPROVE PM<sub>2.5</sub> cartridges
- Twenty-two Teflon® filters from the test lot (11 per box for preliminary testing)



- Twelve Teflon® filters from the current lot
  - Forceps with ceramic tips
  - DryCal® device
  - Worksheet and pen
  - Arbor press
  - Tygon® tubing with DryCal® fitting on one end and T-plug on other
  - Top plug from audit kit
  - One sampling unit, complete with one controller and one PM<sub>2.5</sub> module in the AQG shop.
- 2) Carefully load a current-lot filter into each cassette in all three cartridges, being sure all parts are assembled properly.
  - 3) Copy last year's filter acceptance worksheet. It should be located in U:\IMPROVE\_Lab\Lab\_Gravimetric\Filters. Rename the file to indicate the current year (and set, if applicable). Delete the entries and save the file. Print out the now blank worksheet.
  - 4) Bring the Tygon® tubing with fittings and probe attached, plug from an audit kit, worksheet, and cartridges to the AQG shop.
  - 5) Confirm that the controller in the AQG shop delivers stable data.
  - 6) Attach the Tygon® tubing to the DryCal® using the DryCal® fitting. Tighten the fitting by hand first, and then use a wrench for ¼ of a turn to make sure the fitting is tight. Use the plug from an audit kit to block the top of the T-plug in the module. Insert the probe (attached to the Tygon® tubing) into the bottom of the T-plug in the module.
  - 7) Put the first cartridge into the module. Plug in the controller and enter calibration mode. Go to position 1 of the module being used.
  - 8) Turn the DryCal® on. Write down the pressure value displayed on the DryCal® onto the worksheet. Select "Measure" and then press "Enter."
  - 9) Calibrate using the first position cassette of the first cartridge. Do this by selecting the "Continuous" mode on the DryCal® and press "Enter." The DryCal® will take continuous measurements and will display a running average for the measurements up until the 10<sup>th</sup> consecutive measurement. Then, the running average resets.
  - 10) While the continuous measurements are being taken by the DryCal®, turn the black knob on the valve behind the cyclone until the values on the DryCal® read around 23 lpm. Once it reads about 23 lpm, press "Enter" to pause. Then, select "Burst." The DryCal® will take 10 measurements. If the average value is within +/- 0.01 from 23 lpm, write down the value. Make sure to also record the temperature. If the average value is outside the acceptable range, repeat this step.
  - 11) Run through the rest of the positions in the cartridge using the "Burst" option. Record the readings for each filter, making sure to also note the time and temperature for each reading.
  - 12) After all filters have been measured, choose the filter with the median reading. This filter will be used in position 1 of cartridge 1 when testing the new lot filters.

- 13) Unload the current lot filters into labeled petri dishes. Place one of the median filters into position 1 of the first cartridge, and then fill the rest of the positions in the three cartridges with new lot filters. Repeat step six for the new lot filters.
- 14) Unload the cassettes (except for the median filter in position 1 of cartridge 1) and reload the cassettes with another 11 new lot filters. Repeat step six again.

For preliminary testing, if the Teflon® filters are within the acceptable range for the flow change test, then the test lot is approved. After being approved, a purchase order for the approved lot should be submitted to Pall Corporation by the appropriate employee.

#### 6.1.4 Switching Teflon® Filter Lots

The exact date on which the new Teflon® lot will begin to be used can be predicted using the "RATE LOG" tab described earlier in section 6.1.2. The first filter information for the new Teflon® lot should be listed on the Week 1 log sheet of any given bin. The lot will change at the start of any day, preferably at the beginning of a new cycle (2-3-2 or 3-2-2). When planning for the transition, keep in mind that it is ideal to have approximately two Teflon® filter boxes from the old lot remaining at the end of a transition, so that there are enough for archiving but not too many that go unused.

Once the date for the lot change is chosen, the lab can begin preparation. The new Teflon® lot needs to be swapped with the old Teflon® lot in the weight lab when the correct bins are ready for load with the new lot. Also, remove the problem filters (dropped, specks, holes) from the lab that are from the old lot. Make new empty boxes for the defective filters. Update the Teflon® lot number here: U:\IMPROVE\Support\lotnums.accdb. Add a new row, filling the Site, SAMDAT (sampling date), LOTNUM (lot number), STRDATE (start date), and STRTIME (start time). Write out the full lot number in the COMMENTS field. Once the new lot is all that remains in the weight lab, the new cycle of bins can be loaded.

#### 6.1.5 Reimbursement for Rejected Filters

Filters that should be rejected by the lab include those with visible holes, specks, or threads. Student lab assistants examine the filters at the Pre-sample Weigh-in station and determine whether they are rejects or not. Rejects are placed into labeled boxes; once the boxes become full, they are counted by the students. When the transition between lots occurs, all the reject filters from the old lot need to be counted. Record the total number of rejected filters for a given year in the Excel spreadsheet found at U:\IMPROVE\_Lab\Lab\_Gravimetric\Filter Inventory\YYYY\YYYY\_MM\_DD\_TEFLO FIL LOG.xls, under the "RATE LOG" tab. Report the final tally of reject filters to a principal investigator, who will work with Pall Corporation to obtain financial reimbursement.

### *6.2 Nylon Filters*

#### 6.2.1 Receiving a Nylon Filter Lot

Nylon filters are sent directly from Pall Corporation to Crocker Nuclear Laboratory. Shipments of nylon filters are sent with an invoice and a packing slip. Shipments can range from two boxes of filters to as many as 300 boxes; each box contains 100 nylon filters. Test lot shipments will usually contain around two boxes, while approved lot shipments will usually contain the full number of boxes used for the year (~ 300). Sometimes lot shipments are split and sent within a day or two of each other. When filters are received, count the number of boxes present in the order to verify the packing slip. Sign and date the packing slip and give it to the CNL employee in charge of accounting.

After nylon boxes are stickered, they are sorted into re-closable bags in groups of four boxes. Make sure boxes are sorted in such a way that their box numbers remain sequential. Nylon filters are then stored in the refrigerator in the Room 116.

#### 6.2.2 Nylon Filter Inventory

The nylon inventory files are located at U:\IMPROVE\_Lab\Lab\_Gravimetric\Filter Inventory. There is a separate folder for each year. Within each yearly folder are separate Excel files for nylon, quartz, and Teflon® filters.

Each Excel file contains numerous spreadsheets for logging in sets of boxes of filters. These sheets are created when a shipment of filters arrives and are completed as filters are used. A printed copy of each log sheet is supplied to the lab staff so they can add entries as filters are used.

There is also a "RATE LOG" sheet that keeps track of filter usage and provides an estimated depletion date for the filters on hand. The nylon files also include "LABELS" sheets that are used to create and print labels to be affixed to each box of filters.

Nylon filters come in large shipments, typically around a year's supply. A new set of log sheets and a new set of labels to affix to each box of filters are created for each shipment.

Open the most recent Excel file for nylons and rename it with the date of receipt of the shipment. Some cutting and pasting is required to create the new file, and enough sheets must be created within the file to accommodate the size of the new shipment.

Working from right to left in each sheet, delete the entries in the "DATE" and "INITIALS" columns, as these are completed as the filters are used. Enter the date of receipt of the shipment in the "INPUT" tab and it should update all the log and label sheets.

For the "Box #" column, list pack numbers consecutively starting at "1." There will be 20 pack numbers per page for nylon filters. Boxes are assigned pack numbers after labels are generated and affixed to each box, as described below. If a lot is split into two shipments, the pack number resets and the first box of shipment 2 is "1."

The next column to the left, "Quantity," lists the number of filters in a box. This number is typically 100 for nylons. However, several filters are removed from a few boxes for acceptance testing or other tests, so modify the numbers in the appropriate cells as necessary to reflect the actual number of filters in that box.

The spreadsheet has a "SHIPMENT" column, which is usually "1" unless the order is split and delivered in separate shipments. Find the lot number on a sticker on the filter boxes and enter it into the "Lot #" cell in the "INPUT" tab and all sheets should be updated. The entries in the "REMOVAL," "SIZE," and "PART #" column do not typically change and can

usually be left untouched; however, if the "PART #" changes, enter the new number into the "PART #" cell in the "INPUT" tab.

A set of labels to be affixed to each box of filters is created for each shipment. Go to the "LABELS" sheet to do this. There may be multiple "LABELS" sheets to accommodate the size of the shipment. In most cases, the label sheets will already be updated with the date received and the new lot number. B3 and E3 may need to be modified if it is not shipment #1. All of the other cells in the sheet are linked to these upper-left cells and populate themselves automatically. Print the label sheets onto label stock and affix a label to each box of filters.

A few selected filters from each new lot of nylon filters will need to undergo acceptance testing. Work with the laboratory manager to select these filters and to arrange for laboratory analysis.

Each Excel file contains a "RATE LOG" sheet. This sheet keeps track of the filter usage versus the inventory available and, based on the average rate of usage, predicts when the current lot will run out. Edit the "RATE LOG" sheet, as needed, to contain the same number of rows as the number of spreadsheets in the shipment. For multiple shipments within a spreadsheet, set the appropriate number of rows for each shipment as it comes in. Note that columns C ("PACKAGES") through G ("COMPLETED") are populated by links to individual spreadsheets. When a new "RATE LOG" sheet is created, review it carefully to make sure the links are pointing to the proper sheets based on the "SHIPMENT" and "SET" listed in columns A and B. Referring to the summary formulas at the bottom of the spreadsheet, the "TOTAL" summation should include all the rows of the table, as it shows the total beginning inventory. The "FIL USED" and "AVG" formulas include only the rows associated with the filters used to date, as will be explained further below. Ignore columns to the right of column H.

The weight lab staff will complete an entry on the printed log sheet each time a box of filters is checked out for use. When each sheet is complete, enter these data into the spreadsheets in the Excel files.

Enter the "INITIALS" and "DATE" into each cell on the appropriate sheet.

Proceed to the "RATE LOG" sheet. In cell H3, enter the date on which the log sheet was completed. Check the last completed row in the "RATE LOG" sheet to verify that it corresponds to the log sheet being entered (that row should have been completed by its links to the log sheet).

Then go to the formulas at the bottom of the spreadsheet. In both "FIL USED" and "AVG," change the second cell within the formula parentheses to indicate the row of the log sheet that is being added. If just one log sheet is added, this will involve augmenting the formula by one row (for example, changing (D6:D17) to (D6:D18)).

Now that all of the data are entered, check the depletion date shown in yellow at the bottom of column H. This date is the estimate of when the inventory will run out based on average usage.

#### 6.2.3 Nylon Filter Preliminary/Acceptance Testing

Consistency in flow and composition are the primary requirements for nylon filters being used in the IMPROVE network.

Precut nylon filters from Pall Corporation are purchased by UC Davis in boxes of 100 filters. Approximately two boxes are sent for preliminary testing. Eleven filters from each box (or a total of twenty-two filters) are tested for flow changes, and around five from each box (or totaling ten filters) are sent to the ion contractors for analysis to verify that there are no abnormal artifacts. When certified, the entire lot is authorized for purchase. Acceptance testing is performed again when the filter lot is delivered before they are cleared to go out into the field. The following sections apply to the preparation and analysis of both new test lots of filters and filters that have been pre-approved. Items that apply specifically to only one or the other are noted.

#### *6.2.3.1 Nylon Analysis*

Ten nylon filters from each nylon shipment (including test lot filters for preliminary testing) are sent for analysis by the ion contractor to verify that there are no abnormal artifacts.

- 1) Randomly select ten or more filters apart from the ones used for the pressure tests described below.
- 2) Place each selected filter in a petri dish and label the dishes "TEST0"-"TEST9."
- 3) Package the filters in a petri dish box and ship them overnight to the ion contractor.
- 4) Receive the data and determine the average concentrations and standard deviations for each species.
- 5) Compare the results for the lot being tested with the results from the testing of the lot currently in use. There are ten lab blanks sent each month for comparison.
- 6) Compare the results for the lot being tested with the results from current field blank analysis (if that information is available).
- 7) Forward the results and comparisons to the principal investigator. If the measured concentrations for the two lots are within 5%, the tested blanks are lower than the analyzed lab blanks, and the standard deviation is low, then the filters are accepted for use.
- 8) Set aside one or two boxes from the new lot (after final acceptance testing) for archiving and for maintenance technicians' future audits.

#### *6.2.3.2 Flow Change Test*

The flow change test for nylon filters is essentially the same as the flow change test for Teflon® filters, which is described in section E.1.3.5. The only difference is that the audit cartridge is a B cartridge.

Calculate the average flow rate for the lot being tested. If flow rate shows great variability within the same lot and it is not due to a "leaky" cassette, the filter counts may be increased to see if the trend continues.

The information collected from this test must be sent to the laboratory manager.

If the test lot passes the flow change test and all the prior tests, then it is approved and a purchase order can be placed for next year. If the new lot passes the flow change test and all prior tests, it is cleared for use in field operations.

#### 6.2.4 Switching Nylon Lots

The monitoring of remaining filters from a given lot and the transition between filters is very similar to the procedures for the Teflon® filters. Differences and distinctions are outlined below.

##### *6.2.4.1 Monitoring the Depletion of Nylon Filters*

Nylon filters do not have the same manufacturing problems as Teflon® filters; therefore, there is no need to keep track of the percentage of rejects. Check the "RATE LOG" about once a month (more often when approaching the lot change date) to see what the estimated end date is for the current lot. The "RATE LOG" can be found in U:\IMPROVE\_Lab\Lab\_Gravimetric\Filter Inventory\YYYY\YYYY\_MM\_DD\_NYLON FIL Log.xls.

##### *6.2.4.2 Transitioning Between Lots*

The procedure for the transition between nylon lots is the same as the transition between Teflon® lots, as described in section 6.1.4.

#### *6.3 Quartz Filters*

Quartz filters are sent from Pall Corporation to the carbon contractor, where they are pre-fired and labeled. Quartz shipments are much smaller than nylon and Teflon® shipments, typically around a month's supply of filters. Any paperwork should be signed and dated and filed away in the laboratory. The packet(s) of filters should be stored in the freezer in the chemistry lab (CNL Room 116).

##### 6.3.1 Quartz Filter Inventory

The quartz filter inventory files are located at U:\IMPROVE\_Lab\Lab\_Gravimetric\Filters. There is a separate folder for each year. Within each yearly folder are separate Excel files for nylon, quartz, and Teflon®. Quartz Excel files contain spreadsheets for logging in sets of boxes of filters as well as a "RATE LOG" sheet that keeps track of filter usage.

Because of smaller shipment sizes, a single Excel file can accommodate a year's worth of quartz shipments, with the "SHIP" number designated in each spreadsheet tab. The carbon contractor ships the boxes in vacuum-sealed packets, with around a half-dozen boxes in each packet. It is most convenient to list one or two packets on a sheet, so the number of records in each sheet will vary depending on how the carbon contractor filled the packets. If

fewer than the maximum 12 rows in a sheet are used, delete the formulas in column N for the unused rows, as they will not calculate correctly if left in.

Open the most recent Excel file for quartz and rename it with the date of receipt of this shipment. Again working from right to left in each sheet, delete the entries in the "DATE" and "INITIALS" columns, as these are completed as the filters are used. Enter the date of the receipt of the shipment in the "RECEIVED" column. Information for the next six columns ("QUANTITY" through "PRE-FIRED") is provided on a data sheet that the carbon contractor ships with the filters. Enter this information into the spreadsheets. The entries in the "SIZE" and "FIL TYPE" columns typically do not change, so they can be left untouched.

Each Excel file contains a "RATE LOG" sheet. This sheet keeps track of the filter usage versus the inventory available and based on the average rate of usage, predicts when the current shipment will run out. Edit the "RATE LOG" sheet, as needed, to contain the same number of rows as the number of spreadsheets (common for quartz), set the appropriate number of rows for each shipment as it comes in. Note that columns C ("PACKAGES") through G ("COMPLETED") are populated by links to individual spreadsheets. When a new "RATE LOG" sheet is created, review it carefully to make sure the links are pointing to the proper sheets based on the "SHIPMENT" and "SET" listed in columns A and B. Referring to the summary formulas at the bottom of the spreadsheet, the "TOTAL" summation should include all the rows of the table, as it shows the total beginning inventory. The "FIL USED" and "AVG" formulas include only the rows associated with the filters used to date, as will be explained further below. Ignore columns to the right of column H.

The weight lab staff will complete an entry on the printed log sheet each time a box of filters is checked out for use. When each sheet is complete, enter these data into the spreadsheets in the Excel files.

Enter the "INITIALS" and "DATE" into each cell on the appropriate sheet.

Proceed to the "RATE LOG" sheet. In cell H3, enter the date on which the log sheet was completed. Check the last completed row in the "RATE LOG" sheet to verify that it corresponds to the log sheet being entered (that row should have been completed by its links to the log sheet).

Then go to the formulas at the bottom of the spreadsheet. In both "FIL USED" and "AVG," change the second cell within the formula parentheses to indicate the row of the log sheet that is being added. If just one log sheet is added, this will involve augmenting the formula by one row (for example, changing (D6:D17) to (D6:D18)).

Now that all of the data are entered, check the depletion date shown in yellow at the bottom of column H. This date is the estimate of when the inventory will run out based on average usage.

### 6.3.2 Switching Quartz Lots

Each box of quartz filters has a different lot number written on the top of the box. Students must use sequential box numbers. Sometimes the carbon contractor will skip several box numbers in their numbering scheme. To verify that this has occurred, check the filing cabinet for past inventory sheets.

**TI 251D** Box Receiving

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## **1. PURPOSE AND APPLICABILITY**

This SOP describes the proper procedures for opening IMPROVE blue boxes and transferring the contents to bins. The purpose of this SOP is to establish uniform guidelines for how to perform these tasks.

## **2. SUMMARY OF THE METHOD**

IMPROVE blue boxes are not permitted in the sample handling laboratory to reduce the chance of contamination. Thus, contents of these boxes must be removed and placed into matching site bins in the shipping/receiving area for the sample handling lab before getting transferred to the lab. Bins are brought back into the shipping/receiving area after new filters have been loaded. The contents are put back into the blue boxes and shipped out into the field.

## **3. CAUTIONS**

Some site codes are very similar. Because of this, it is very important to make sure that filters are placed into the correct bins and that clean filters are shipped out in the proper box.

## **4. EQUIPMENT AND SUPPLIES**

- Computer with Lab Application
- Blue boxes containing sampled filters
- Bins labeled with site names
- Computer with IMPROVE Filter Processing application
- Barcode scanner
- Post-it® Notes
- Colored pens (other than red)
- Box Cutter

## **5. PROCEDURES**

Prior to beginning work, open the Improve Filter Processing laboratory application (Lab app). Open Post-sampling then select Box Receiving, check if there are any sites in the queue. Do not start processing a box if there are no sites in the queue.

### *5.1. Proper Way to Open a Box*

#### 5.1.1. Removing Labels/Tape

When boxes arrive at Jungerman Hall, they are stacked on the floor in the main bay, right outside of the IMPROVE shop. Bring the boxes into the shipping/receiving area for the sample handling lab and place them on the counter to the right of the door. IMPROVE bins for all sites are on the shelf above the counter.

When opening a box, remove any tape that the operator may have put on the box to

secure it for shipping. A box cutter may be used to cut the tape, but do not damage the box in the process. Remove as much of the tape as possible. Do not remove the box-top label located on top of the box in the far left corner. It should have the site name and three installation dates. Do not remove the shipping label as this must be scanned.

#### 5.1.2. Checking in Boxes

- 1) Select a blue box to open, and then locate the associated bin. The bins are labeled with the site code four letters followed by a number (1-9). Site bins are also color-coded. Yellow bins are for the (2-3-2') boxes, and blue bins are for the (3-2-2') boxes. The bin will also have an associated barcode. If the site contains an X-site then a second barcode will be present.
- 2) Log in to the computer, the login information is located on a sticker at the corner of the computer screen. Open the Improve Filter Processing application (lab app). Select Post Sampling then select "Box Receiving".
- 3) Using the barcode scanner, scan the barcode associated with the main site. If an X-site is present only scan the main site. The program will check-in both boxes at the same time. Do not type in the site code.
- 4) Verify the correct box is open by checking the "Box Weeks" with the three bags labels for main site. If X-site is present then verify bag labels for this site as well.
- 5) Scan the return label into the "Inbound Tracking Number". The tracking number is validated, if incorrect numbers then verify the correct box was received and write a note in the comments section.
- 6) Remove the bags and place into the correct bin.
- 7) Remove log sheets and flashcard. See section 5.1.3 for more information. If log sheets and flashcard are the correct ones then click "correct dates" and "flashcard." If the flashcard number is incorrect then write a comment. If dates are incorrect then inform lab tech immediately.
- 8) Remove box top labels and return labels.
- 9) Place the empty box on one of the shelves, grouped by alphabet. If it is a replacement box, please place it on top of the shelves so that it is not accidentally re-used. If there is no labeled bin for a site, use one of the extra bins located underneath the counter. Be sure to use a bin of the appropriate color.
- 10) Go to section 5.1.4 for flagging problems.

#### 5.1.3. Locating the Flashcard

Every box should contain at least one flashcard, which is labeled with an eight-digit number on one side and the site code and UC code on the other. Typically, the flashcard is found in the Week 3 bag because the operator removes the flashcard at the end of the week. However, if a flashcard is not there, please thoroughly check the other two bags as well as inside the box itself. Sometimes it is best to empty the contents of each week to find a flashcard, as it can get stuck in the log sheet or hidden under cartridges. If a flashcard is not found in the box, make a note on the Week 1 log sheet indicating that no flashcard was returned. In the lab app, do not select the box for the flashcard and type "No Flashcard" in the comment section.

Sometimes a flashcard will have a label that reads “IMPROVE Replacement” instead of a site name. In this case, it is important to label the flashcard with a Post-it identifying which box it was taken out of.

After pulling out the flashcard, please remove the log sheets from each week bag. If a flashcard is found, then verify the flashcard number and select the appropriate box. If the flashcard number does not match, then do not select the flashcard box and type the number of the flashcard received. After confirming this, please place the flashcards to the side. Stack flashcards in the order the boxes were opened.

#### 5.1.4. Flagging a Problem

Stack all “normal” log sheets together by site with week 1 on top and week 3 on bottom. When finished opening boxes, give the pile of log sheets to a lab tech along with the flashcards.

If a log sheet had a problem, please stack all three log sheets for that site and place them in a separate pile with the associate flashcard. These log sheets will be reviewed before the “normal” log sheets to ensure a quick response to any problems that may be causing sample losses at a site. Note that, if the site has an X-module, both the main box log sheets and the X-box log sheets need to be kept together and put in the same pile, even if only one of them has a problem log sheet.

If any questions arise while opening boxes or something is unclear, please ask a lab tech.

#### 5.1.5. Delivering Bins to the Sample Handling Lab

Loaded bins are placed onto a cart located directly outside of the IMPROVE shop. Once all boxes have been opened, take the cart into the sample handling lab and transfer the bins onto the large silver rack on the left wall. Then return the cart to the area outside of the shop.

## TI 251E Entering Log Sheets and Simple Problem Diagnosis

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## **1. PURPOSE AND APPLICABILITY**

The purpose of this SOP is to describe the procedures used to download flashcard information, diagnose simple sampling problems, and enter log sheet data. These procedures are applicable to all routine IMPROVE sites.

## **2. SUMMARY OF METHOD**

Flashcard information is downloaded (if available) and log sheets are examined for potential issues. Any significant problems are directed towards the field maintenance team through JIRA. Log sheet data is then entered into an application called Improve Filter Processing, which writes the information to SQL database.

## **3. CAUTIONS**

If a main box has an X-box also, make sure to enter X-box log sheets immediately after entering the main box log sheets.

Examine log sheet values and flow data carefully. Missing a substantial problem could lead to losing a site for the year. If unsure about whether or not something is a problem, err on the side of caution and contact the field maintenance supervisor.

Report equipment problems to the field maintenance team immediately. Not doing so could result in further sample loss.

Pay careful attention to the name of the site when entering log sheets. Some site names are very similar, and the correct site name must be typed in when entering the log sheets. Typing in the wrong site name could result in significant confusion later in the process.

## **4. PERSONNEL QUALIFICATIONS**

Only trained laboratory technicians and members of the field maintenance team can perform the operations described in this SOP.

## **5. EQUIPMENT AND SUPPLIES**

- Flashcard reader
- Desktop computer (PC) (for reading flashcards) with Lab Application
- Computer with network access

## **6. PROCEDURE**

### *6.1 Reading Flashcards*

To read flashcards, use the designated computer in the sample handling lab. Plug in the flashcard reader if it is not already prepared. Sign in to the computer using the appropriate Kerberos login information.

Insert a flashcard into the reader. Click on the Windows icon in the lower left-hand corner, and then choose "Computer." To prepare to download the card, open the U:\ drive and go to U:\IMPROVE\FlashTXT and choose the site file that corresponds to the flashcard.

Go back to the Windows icon and click on "Computer" again. In this window, choose either "Transcend (D:)" or "Removable disk (D:)" to view the flashcard files. Transcend® flashcards will have the former title and Kodak® flashcards will have the latter.

The number of files will vary depending on the program version running the controller at the site. There are three different program versions currently out in the field; the network is moving over towards 7.0N and should be completely transferred over by the end of 2013.

#### 6.1.1 Version 6.02

Flashcards used in controllers running version 6.02 will have only one file, and it will be named TEMPFLSH.TXT. Rename the file using the site's four digit UC CODE and the date of the first Tuesday install (or Thursday in rare cases). The format is UC CODEMMDDYY. Then copy and paste the file directly. Do not cut and paste just in case something goes wrong with the file transfer. Once the file is moved, open it again in its new location to make sure it opens properly. After confirming that it does, delete the original file from the flashcard window to clear the card and prepare it for re-use.

#### 6.1.2 Version 7.0M

There will typically be two to four files for sites running on 7.0M. There will be a file already labeled with UCID and the month and day of the first install date. After checking to make sure the file opens properly, add the year (YY) to the end of the file name. Note that initials taken for week 1 of the next box may be in a separate, smaller .TXT file labeled with the month and date of the first install date for the next box. If present, open this file and copy the rows with data (not the column headers). Open the primary .TXT file and scroll to the bottom. Paste the rows below the finals readings for week 3. Then, save this .TXT file. The smaller .TXT file can now be deleted. There should also be two log files. The log files will be named "logMMDD.TXT," with MMDD being the month and date of first install for the current box cycle under review. Click on it to confirm that it opens properly. Then, add the year to the log file title (YY). If present, open the smaller log file, which should be named with the month and date of first install for the next box cycle. Copy the lines of data (without column headers) and paste them at the end of the primary log file. Save the file. It is now safe to delete the smaller log file. Transfer the modified data file and log file to the appropriate site folder. Note that there will be an additional folder for log files within the site folder. Check both the log and data files to make sure they open properly. Then, delete the original files from the flashcard.

#### 6.1.3 Version 7.0N

There should be only one data file and one log file for this version. Add the year to each file (YY) and transfer them as described above. Sometimes, there will be an additional data file and log file (if the operator performs the flashcard swap at an incorrect time during the sample change); modify these following the steps described above for 7.0M.

NOTE: If a flashcard is blank, give it to IT. If nothing can be recovered, write "QD" in red pen on the right hand side of each log sheet, with an arrow going down the whole sheet. Write "CFLSH blank" at the bottom of the first log sheet.

If there is no flashcard for a box, mark all of the log sheets as "QD" as described above. The lab assistant who opened the box should have written, "No flashcard" at the bottom of the first log sheet. If the comment is not there, add it in red pen.

If a flashcard has files on it but they will not open, give the files to IT. If the files are not recoverable, follow the steps described above.

If the flashcard is a replacement card, please open U:\IMPROVE\FlashTXT\Replacement Log.xls. Click on the "Replacement Card" tab and find the entry for the replacement card. Enter the date the card was returned, save the file, and close it. Return the replacement card to the stack of cards on the file tray.

If it is a regular site card, stack it with other cleared site cards. When all cards have been read, put them in the flashcard box by the PRE station.

## 6.2 Ingesting the Flashcard

- 1) Login to <http://crocker.ucdavis.edu/improvedb> using Kerberos authentication. Mouse over the Field Data tab and press "Upload Flow Data." If this menu option does not appear, request permissions from the development group.
- 2) Press "Select." Go to U:\IMPROVE\FlashTXT. Find the correct site folder and choose the file that was most recently transferred off of the flashcard. Click "Open."
- 3) Press "Upload." Click "Files for Review" in the Field Data drop-down menu.
- 4) Press the "Review" tab next to the newly-uploaded file.
- 5) Click "Post" if the program allows. The button for this should be below the review tab at the top of the page. If the program does not allow this, read the error messages that appear. Typically a flashcard will not be ingested if there is corrupt data, if there has been a time or date change, or if there are multiple UCIDs in the file. Contact either the Field Operations supervisor or a lab technician who has been cleared to modify flashcard data.
- 6) If the file has been posted, the data are available for viewing through IMPROVE flow.xls.

## 6.3 Reviewing the Log Sheets

Log sheets are reviewed to spot issues that need to be examined more closely using flashcard data. There are several things in particular to look out for:

- 1) **Elapsed Time (ET).** A run day typically consists of 1440 minutes. The exception to this is the moveable position filter. This filter is running if the operator performs the sample change on the day designated on the log sheet. The operator must interrupt the sample to change out the cartridges and to transfer moveable position cassettes to the next week's cartridge. Thus, the ET will typically be somewhat shorter on this day. A value of  $ET \geq 1410$  is accepted; anything less than that should be reviewed for equipment swaps, power interrupts, or other problems.

**NOTE:** Sometimes one of the ETs for the moveable position may read 0. The ET for the

moveable position is recorded twice; once before it is moved over to a new cartridge and again when that “new” cartridge is uninstalled the next week. If one ET reads zero, check the other. Typically when this occurs, the operator performed the sample change before or after the moveable position run day. In this case, the other ET listed should be 1440.

If ETs are scrambled, very high, or very low, it may be easier to confirm real ETs by examining flashcard data through IMPROVE flow.xls or through the flashcard .TXT file. ETs are usually not over 1440 unless the controller has scrambled ETs due to a lightning strike. However, a rare and special case with version 7.0N is if a sample change is missed for a moveable position day and the next sample change isn’t performed until 3 weeks later on another moveable position day. In this case, the controller will log the full run time of the first sample and append the time for the later sample, thus possibly exceeding 1440 minutes.

- 2) **Sample Change Dates.** Sample changes should be performed on Tuesdays. There are only a few exceptions to this rule. If a sample change is not performed on a Tuesday, it is important to note when it was performed and if it affected any sample ETs. Each log sheet shows the sample days for its corresponding week. In order to have valid samples for the entire week, the sample change must not be performed later than 6.0 hours after the start of the sample day (with the exception of the moveable position). If any sample has an ET<1080 due to a late sample change, that sample needs to be assigned a status of NS (No service/no sample). This status can be confirmed by reviewing flashcard data. This will be discussed further in the “Simple Problems” section.

If a log sheet is blank, the filters may not have sampled. Check the install dates on the other log sheets and look for notes from the operator indicating a missed sample change. As described above, filters that do not sample due to a late sample change receive a status of NS. Confirm a missed sample change by using flashcard data.

- 3) **Max VAC/ORI Values.** There are four MxORI values on each log sheet, one for each module. The highest value is 40. Acceptable ranges are from 35-40. If one or more of these values is significantly below this, contact the field maintenance team. An exception to this is if the site is a high elevation site, which can cause MxORI values to run between 30-35. In this case, report anything that is under 30. If unsure about whether the site is high elevation or not, ask a maintenance team member.

If a MxORI value reads 10, this *usually* indicates that the pump is malfunctioning and/or is not turning on. Check the flashcard data to confirm whether the pump was running. See the below sections on flashcard data reviewing and simple problems for more information.

- 4) **ORI and CYC Values.** The ORI and CYC values listed on log sheets are a real-time snapshot of what the transducer values were when the operator was at the site for the sample change. These values are taken both when cartridges are installed and when they are uninstalled.

Check the ORI values for each module across weeks. These values should be fairly



stable across the three weeks. Each type of filter medium has its own typical range of ORI values. Teflon® filters (“A” and “D” modules) are typically 11-12 (sometimes 10-13) unless critical orifice has been installed on “D” module then ORI values are typically 17-18. Nylon filters are the most variable, but a typical range would be 12-14. Quartz filters are lightly variable and are likely to be around 15.

CYC values should be similar for all modules except for the “D.” The “D” mod does not have a CYC channel so it will read at zero values, which are typically between 4 and 5.

If any of the CYC readings seem significantly different from the rest, take note of it and review it more closely using flashcard data.

Something to pay particular attention to is the pattern of the “C” module ORI and CYC values. Quartz filters are the most likely to have double filters loaded instead of one. If a site should have single C’s, ORI will increase and CYC will drop if double filters are loaded. If there is a significant pattern disruption among the “C” values along these lines, follow the instructions in “Simple Problems” for “C” module issues.

#### *6.4 Reading Flashcard Files*

The flashcard data file for version 6.02 contains the UCID, date, time, solenoid position, transducer values for all modules, temperature (in mV), operator initials, time interval, and EPROM version number. Readings are taken every 15 minutes, whether samplers are running or not.

Versions 7.0M and 7.0N flashcard data files look slightly different than version 6.02. Each reading for these versions shows UCID, start time of the interval, end time of the interval (interval is typically 15 minutes), GMT offset, whether the controller is sampling or not (OFF or ON), transducer values for all MODs, temperature (in mV), running ET of the sample if it is a sample day, operator initials, and version type. Readings are taken in intervals of 15 minutes.

Note that transducer values are listed in different orders depending on program type. For each module, version 6.02 displays the CYC value first (called MAG in 6.02) followed by the ORI value (or VAC in 6.02). 7.0M and 7.0N display the values in the order that the log sheet and controller do, which is ORI first and then CYC.

Versions 7.0M and 7.0N also contain a log file. 7.0M takes readings every minute on the log file, while 7.0N takes readings every 15 minutes. Log files show the UCID, controller ID, and details of time/date/GMT offset changes, sample changes, etc. The log files are used for advanced troubleshooting.

Flashcard files can be helpful in determining what may have happened to a piece of equipment and when, if an operator was late or early doing the sample change, if the date and time on the controller was changed, etc. Looking at the finals and initials values can also be helpful when trying to determine if cartridges were swapped or placed in the module upside down.

#### *6.5 Using IMPROVE Flow*

IMPROVE Flow.xls is a data connection to CNL’s SQL server through Excel used to graph flashcard data in order to make it easier to spot transducer value trends and sampling issues.

Please see J. MOJICA for the most current version.

To use, open the file and click "Enable Editing" if prompted. Type in the desired start and end dates; these usually encompass the three weeks of the box cycle plus a week or two previous to the box installation. Then enter the site name. The data in the cells below will update. If the site's most recent calibration has an X-module, check the box below the calibration date cell. If it does not have one, leave the box empty. Then, press the nominal values button. The calibration date box should update to show the last calibration date for the site, and the module values (colored red, yellow, green, blue, and orange if applicable) should change.

To view a module individually, click on the corresponding tab. Note that the X-MOD tab is labeled as "E Flow." There is also a tab to view temperature data and a tab that will display transducer values for all modules in the same graph, entitled "All Flows."

Each graph shows the transducer values recorded on the flashcard in the form of a graph. The graphs provide a guide for appropriate values by placing range lines showing  $\pm 5\%$  of the flow rate, which should be 23.0lpm for modules A-C and 16.9lpm for the D. Use these indicator lines to help determine transducer value shifts due to equipment replacement or problems, swapped cartridges, double/single filters loaded for the C MOD, etc. Absence of transducer values indicates that there is no flashcard data for that time period.

## 6.6 Input Log Sheets

If all values appear to be in range and appropriate for the site, it is time to enter the log sheets.

A shortcut for the current version of Improve Filter Processing application should be available on the desktop. If a shortcut is not available then check the start menu or talk to IT. Click on it to open the application, select Post-Sampling then click on Input Log Sheets. Enter user initials. Type in the full site code for the log sheets being entered or click on the correct site in the queue. The program will display all three weeks of the box. Operator initials, start and end dates, start and end times, ETs, sample dates, and some other columns are all already filled in. If all values are in range and flashcard data is available, then for each week click "INSERT DUMMY RECORDS" located above Final Readings. Dummy Records fills Sampler Temp, MxORI, ORI, and CYC with "-99," ET with "-9999", Operator initials with "ZZZ," and start and end times with "0000". If values are not within appropriate range or flashcard data was not received then log sheet values must be entered manually. Sample dates are set, but the other pre-filled fields can be modified if necessary. Use the Tab or Enter key to move forward to the next field, and Shift + Tab to move back to the previous field. Enter the initials of the operator who performed finals for week 1. If the field on the log sheet is blank, look it up in the flow table of IMPROVE flow or the flashcard .TXT file. Enter in the times that initials and finals were taken. Make sure to use military (24-hour) time, as "am" and "pm" options are not available. Make sure the sample change dates are correct; the lab app automatically fills in the Tuesday installation date (or Thursday in rare cases). If the operator performed the sample change on an alternate date, modify the date.

The rest of the fields are entered by going down the columns, instead of going across rows. Fill in the MxORI values for all of the modules, from A through D. If two or more values

in a row are the same, type in the first value to start with and then press the “+” key on the number pad. To copy the same value. This is the preferred method for entering repeating values, as it reduces the chance of typing errors.

Next, enter in the initial ORI values for each sample date and module, followed by the initial CYC values. Then, enter the final ORI and CYC values. For 3-2’-2 boxes, there will be 3 entries for week 1 initials and only 2 for finals. The final value for the third position, or moveable, will be added in the second week. 2-3-2’ will have this set-up in weeks 2 and 3.

The next column is for ETs. It is already populated with 1440 ETs; if this is correct, go ahead and Tab through to the status column. If any of the ETs are not 1440, modify them as necessary.

Next, enter in the status code for each sample. The default status is “SO”, if the samples are normal, the code to use is “NM.” Other codes are described in section 6.7. Fill in the status boxes.

The next column is called “UseL.” If flashcard information is available for the dates being entered, leave this column as default, which is prefilled with “F.” If there is no flashcard data, change the “F”s to “T”s. More on this can be found in section 6.7.5.

The next column is temperature. Temperature is listed on the log sheet above the “Finals” values. If the site has a version 6.02 EPROM, the temperature will be displayed in millivolts (mV). There is a chart posted in the sample handling laboratory that shows the conversions from mV to °C and °F. Convert the temperature from mV to °C and type it in the first box. Press “+” to add the values to the addition cell(s).

The final column should be left as default (F) unless there are no flashcard data or unreliable temperature values. In that case, change the value to “T.”

If a comment needs to be entered, press F12. A box in the upper left corner will pop up. Note that a date will be at the top of the box; this is the sample date for the first position of the week. Pressing “Enter” will change the sample date. If an issue applies to only one sample, make sure to note it only in the box with the appropriate date. If an issue applies to the whole week, leave a comment for each sample date. The comments database can be found in U:\IMPROVE\Logs\StatusFlags\2015 Comment Database.xls.

When finished with the week, press F3 to save or F4 to quit without saving. Repeat these steps for the remaining weeks. If the site has an X-module, enter the log sheets for the X-mod immediately after the main site. Note that the operator initials, sample change dates and time will not be modifiable for X-mod boxes; they will be filled in with data from the main box.

## *6.7 Simple Problems*

### 6.7.1 Power Interrupt/Power Outage

Some IMPROVE sites are in remote locations or have frequent severe weather, leading to power interrupts or outages. When the power is off, all equipment shuts down including the controller unless the controller has back-up power. However, if a site has a backup UPS, only the controller will remain functional and the sampling will halt if it is a sample day.

If there is a short ET on the log sheet and flashcard data indicate a data gap (complete

absence of any data lines on the chart, several hours or days between readings in the .TXT file), then it is likely a power issue. Look for comments from the operator on the log sheets regarding loss of power at the site.

If loss of power causes a sample to have an ET of less than 1440 but more than 1080, it is considered to be a “power interrupt.” There is a comment for this in the comment database that should be entered for the appropriate sample date(s) while entering the log sheet. As long as there are no other issues with the sample(s), the status(es) should remain NM.

If loss of power causes a sample ET to be less than 1080, the sample is terminal and is considered a “power outage.” Copy and paste the appropriate comment found in the comments database for the appropriate day(s), and status the sample(s) as PO (for Power Outage).

#### 6.7.2 Simple Pump Malfunctions

There are several things on the log sheets and in the flashcard data that can indicate a pump issue. MxORI is listed for each module on every log sheet. The typical acceptable range is from 35-40. Sometimes these values are lower depending on elevation. However, if any pump’s MxORI is below 30, contact the field maintenance team and let them know, as they may want to replace the pump.

A dead pump will not turn on at all, and the MxORI will read 10, which is the resting value when the pump is not functioning. Initial and/or Final ORI readings for that module may also be at resting transducer values (typically 10 for ORI, 5 for CYC). Use flashcard data to determine when the pump failed and how many samples were affected. If the pump failed for less than six hours in a run day, use the appropriate comment but keep the status as NM. If the pump failed for more than six hours on a run day (valid ET<1080), the sample will receive a status of EP (Equipment Problem) and the appropriate pump failure comment should be used. Make sure for either situation to indicate in the comment which module had the failure.

Note that as long as the controller is on and functioning, the controller will think that the pump is on and provide an ET for a full run day as long as there are no other issues. To calculate the real ET, examine the flashcard and find the length in time that the pump was down, and then subtract it from the 1440 ET.

Notify the field maintenance team immediately so that they can troubleshoot the issue with the operators, especially if two or more pumps fail simultaneously. While this situation is likely merely a dead pump, other factors could be at play to cause similar symptoms and must be evaluated as soon as possible.

#### 6.7.3 Late Sample Change

As mentioned previously, operators install filters every week on a designated day (usually Tuesday). If an operator is late performing this change, sample loss is possible. The log sheet should have the dates of sample changes written on them. Any samples that occurred between the appropriate installation date and the date the operator did the sample change will likely have an ET of zero unless it was a late sample change on a

sample day. Confirm this by examining flashcard data through the .TXT file or through IMPROVE flow; the controller should have locked out after the designated day and the transducer readings for sample days after that day should read resting values. The final readings' ET should also read "0." These samples should be designated with a status of "NS." If a late sample change occurs during a sample day (not the 3<sup>rd</sup> position), the sample is only valid if the final ET is above 1080 minutes. Anything less is an "NS." If a week is missed completely (usually indicated by a blank log sheet), all of the samples for that week are "NS." Make sure to use the appropriate comment for each scenario using the comments database.

Sometimes a late sample change is due to a blue box being shipped late. In this case, missed samples are still considered an "NS," but receive the comment that indicates the late sample change was due to the blue box and not the operator.

#### 6.7.4 C MOD Filter Issues

IMPROVE no longer has double-C FIL sites, in the past two C filters were loaded instead of one for each sampling position. Double-C FIL positions have higher ORI values than single C FIL modules due to the increase in resistance because of the two filters.

Sometimes a mistake occurs during the filter processing and a single C cassette is loaded as a double-C (quartz filters sometimes stick together and it can be difficult to tell that two are sandwiched together). When double-C filters are loaded instead of a single C, the ORI value increases and the CYC value drops several points due to the increase in resistance. If a double-C filter is suspected, physically check the cassette to determine for sure that two filters were loaded. If so, assign the sample a status of "QD" and enter the appropriate comment in the lab app.

#### 6.7.5 Flashcard Issues

Sometimes operators forget to return flashcards. The student assistant who opened the box at the Box Receiving Station should have added a comment stating that the flashcard is missing. Do a quick check of the week bags to be sure that there is no CFLSH. If the flashcard is indeed missing, assign a status of "NM" to all of the filters and change the "UseL" and "UseTL" flags from "F" to "T." For every week that is missing flashcard data set flags click on "USE LOGS" located above "Final Readings" to change. Also add the appropriate comment from the database.

Make a call to the operator to track down the flashcard and have it sent back. When it arrives, check the data. If the data are complete, change the "UseL" and "UseTL" flags back to "F" and assign statuses as needed, and comment "CFLSH recovered".

Sometimes flashcards fail during a box. If there is only partial flashcard data (not the full three weeks), follow the steps above for any samples that do not have corresponding flashcard data.

#### 6.7.6 D Cartridge Upside Down

The "D" cartridge is the only cartridge that is installed with the cassettes pointing towards the bottom of the module. Because of this, operators sometimes install it the

same way as the A-C cartridges, which for the “D” cartridge is incorrect. If the “D” cartridge samples in the wrong orientation, the first position ORI values (and possibly the second if it is a 3-filter cartridge) will be very high (35-40) and the CYC will be very low (around 5) because the first (and second if applicable) will run on a paper position. The filters also may be blown out. Any deposit on the filters will be on the incorrect side. When this occurs, the filters in that cartridge should be assigned a status of BI (for Bad Install) and the appropriate comment should be used.

Sometimes an operator will catch the mistake during filter readings. If the initial readings look abnormal (40 and 5 for the first position) but the final readings are correct, the operator may have fixed the issue. Inspect the cartridges to confirm that the filters are intact and the sample is on the correct side. Also check flashcard data to confirm good run day values. Rule out any other equipment issue (like a “sticky” solenoid) by talking to the field maintenance supervisor. If everything checks out, assign the filters a status of “NM” and note in the comments field that the D MOD ran fine, as the initial values will look incorrect.

#### 6.7.7 Missing Screens

The “A,” “C,” and “D” cartridges are loaded with loose screens. While extremely rare, a cartridge may be sent out without loaded loose screens. The danger in this is that the filters will tear and the loose material may cause the valve to clog. If there are cassettes with missing loose screens but no filter tears, the ORI values should be low and the CYC values should be high due to reduced resistance. Examine the physical cartridges to confirm that a missing loose screen is the cause for the reduced resistance. Samples that do not have loose screens but are not torn are given a status of “QD” until all further analyses have been completed. If both ORI and CYC values for samples of a module are lower than normal (which would occur if flow is reduced due to a clogged valve), check the physical cartridges to see if loose screens were loaded for all samples and that all filters are intact.

If there is a filter that is torn and a screen that is missing in any cassette, contact the field maintenance team immediately. Samples that are torn due to missing loose screens are given the status “XX” (which implies that the lab was at fault for the terminal issue). If a clog in the valve exists due to a torn filter, discuss the situation with the field maintenance supervisor to determine whether or not the reduced flow is low enough for subsequent samples to be given terminal statuses.

#### 6.7.8 Bad Temperature

A temperature probe is located in the “C” module and its values are recorded on the same interval as transducer values. When temperature probes malfunction, the values typically read around “4095.” If a trend like this is noticed, notify field maintenance. Also, if temperatures seem abnormally low or high for a site, talk to the field maintenance team to determine whether the temperature offset may have been set incorrectly (version 6.02 controllers) or whether some other issue is occurring.

#### 6.7.9 Other Issues

Many other problems may occur with IMPROVE equipment; this SOP is only meant to discuss the simpler problems that may occur. If values do not look correct and the problems listed above are not applicable, please contact the field maintenance supervisor or an experienced lab or development technician to help determine the source of the problem.

## **7. DATA AND RECORDS MANAGEMENT**

Log sheet data are entered through the Lab Application. The corresponding flashcard data are uploaded to a SQL database through the use of a web application called IMPROVE Database Manager. A data connection to the SQL database through Excel is used to graph the flow data in order to help the diagnosis of log sheets. Finally, an Excel file called the Comments Database is used to store standardized comments for use in entering log sheets.

### *7.1 Input Log Sheets*

The Improve Filter Processing application (lab app) is used to record data from the field log sheets for exposed filters into the LOGS table in SQL database. Through this program, temperature, pump vacuum readings, orifice and cyclone values, elapsed sampling time, and filter status are recorded for each filter. A shortcut for the application will be located on the desktop. The developers and IT department coordinate application updates and will automatically set up a shortcut on the desktop. Contact IT or developers if any issues.

### *7.2 IMPROVE DBM*

IMPROVE Database Manager is a web application (located at <http://improve.crocker.ucdavis.edu>). For the purposes of this SOP, its primary function is to review flashcard data and then upload it to the SQL database. The system will alert the user to any irregularities in the data, such as multiple UCIDs, time changes, or extended power outages.

### *7.3 IMPROVE Flow*

IMPROVE Flow is an Excel file and is used by the lab and other IMPROVE personnel to graph flow data for any site in the network. Users have the ability to view each module separately with the acceptable range of values displayed on the screen, providing users with a quick and easy way to determine if flow values are too high or too low. Users may also view all modules' flow data in the same graph.

Finally, temperature values are also graphed for the user's convenience.

### *7.4 Comment Database*

The Comment Database is an Excel file located in U:\IMPROVE\Logs>StatusFlags\2015 Comment Database.xls. It contains standardized comments to use in Input Log Sheets, the comments have been uploaded to the Improve Filter Processing Application. The comments are grouped according to common issues/problems. Each comment also indicates what

status code to use for the samples the comment applies to; the lab app does not include the associated status code with the comments.

## **8. QUALITY ASSURANCE/QUALITY CONTROL**

Because diagnosing of problems can be difficult and somewhat up to interpretation based on available data, all log sheets that have significant problems or those that required a differential diagnosis are given to the field maintenance supervisor to “double” after they have been entered. “Doubling” in this case refers to the field supervisor re-diagnosing the log sheets and making any changes as necessary. The supervisor will also check to make sure comments and values were typed in correctly.

All simple problem and normal log sheets are “doubled” in the sample handling lab. Simple problem log sheets are “doubled” by lab technicians other than the person who entered the log sheets to confirm the problem and to check that comments and values were entered correctly. Student lab assistants may “double” normal log sheets, as entered values only need to be checked for typos.

Also, student lab assistants are trained to alert lab technicians anywhere down the line during filter processing if anything unusual occurs or is found with a sample (ex. anodizing dust present on the filter, large hole, low filter weight difference, etc.) that may affect the filter status.



**TI 251F** Post-sample Processing

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## **1. PURPOSE AND APPLICABILITY**

The purpose of this standard operating procedure is to describe in detail the procedures used at the Post-sample Processing. It is applicable to all routine filters in the IMPROVE network.

## **2. SUMMARY OF THE METHOD**

Once all log sheets have been entered for a bin, the bin is ready for the first station of the Post-Sampling. A custom designed application "Improve Filter Processing" (Lab app) is used to process nylon and quartz filters. At the Post-sample Processing station, sampled nylon and quartz filters are placed into petri dishes and put away in a specific order generated by a macro. Only nylon, quartz and associated field blanks with a "problem" status are removed at this station. These filters are also ordered according to a generated list and stored permanently. Custom designed application "Improve Filter Processing".

## **3. CAUTIONS**

Many site codes look similar. It is important to make sure that the correct bin is being processed by scanning the barcode associated with the specific bin.

Be very careful to make sure that the correct forceps are used for each filter medium. Quartz filters flake very easily and can contaminate other filter types, so it is important to use the appropriate forceps when processing these filters.

Do not clean nylon cassette bottoms with a Kimwipe™ that has been used to clean quartz cassette bottoms. The simplest way to prevent this from happening is to discard Kimwipes™ after cleaning all quartz cassette bottoms and getting new Kimwipes™ for the next bin.

## **4. EQUIPMENT AND SUPPLIES**

- Forceps for nylon filters
- Forceps for quartz filters
- Computer with "Improve Filter Processing" application
- Computer with "Traycheck Lists.xlsm" macro
- Three empty Petri trays (one for nylons, one for quartz, and one for problem filters)
- Brush for quartz
- Ethanol in appropriate container
- Kimwipes™
- Container for loose C screens
- Arbor press
- Clean Petri dishes

## **5. PROCEDURE**

### *5.1 Petri Dish and Tray Setup*

On the counter to the right of the Post-sample Processing station are ½ trays full of Petri dishes with already processed B and C filters. The top of the Petri dishes (the sides without the Pall logo) should have a sticker placed on them and be facing forward when placed in the tray. The Petri dishes are placed in the tray starting from the back left and moving forward in the order processed. Within each site, the oldest dates go in first. Problem filters should be placed in a separate tray labeled “Problems” with the oldest date first as well. If problem filters share a date, place them in the order of their cartridge letters, with B (first) to C (last). Field blank (FB) problems follow the associated filter type.

All trays are labeled with the name of the type of filter that belongs in them. Trays labeled “Ions” are for the nylon filters, and the trays labeled “Carbon” are for the C filters. Problem trays are labeled as “Problems.” Note that there are two different problems trays. One is for problems that are regular A-C filters. The other problems tray is found next to the Post-Sample weighing station and temporarily holds the A problem filters. It is important to make sure that the processed filters are placed into their proper tray.

Prior to beginning work, open the Improve Filter Processing laboratory application (Lab app). Open Post-sampling then select Post-sample Processing, check if there are any sites in the queue. Do not start processing a box if there are no sites in the queue. If sites are available then select a bin that appears in the queue, use the scanner to scan the barcode associated with the site. If there are site bins ready to be processed that do not show up on the queue, ask a lab tech for help.

The Post-sample Processing screen will include site name (top of screen), below the site name are two tables; one for B module (nylon filters) and the other for C module (quartz filters) (Figure 1). Each table contains the following columns “STATUS” for filter status, “SAMDAT” for sampling date, “QTR” for calendar quarter, “POS” for position number and “PROBLEMS?”.

A field blank table may appear below the B module table only if a field blank is loaded for either B or C module. The field blank table will include field blank type, “STATUS”, “SAMDAT”, “QTR”, “POS”, and “PROBLEMS?”. Confirm that there is a field blank where the column indicates that there is one and that the type of filter is correct.

The “PROBLEMS?” button will open a pop-up window to report sample problems (Figure 2). Filter status can be normal or terminal. Normal statuses include NM and QD. The terminal statuses are also called “problems” and will be highlighted in red: PO, EP, NS, BI, OL, and XX (Chart 1).

Main Menu

Current User Initials: MGN

Station: Post-sample Processing
for site: **GRBA1 (A, B, C, D)**

Module B

STATUS	SAMDAT	QTR	POS	PROBLEMS?
NM	09/01/2015	C15	41	<a href="#">PROBLEM</a>
EP	10/03/2015	D15	1	<a href="#">PROBLEM</a>
EP	10/06/2015	D15	2	<a href="#">PROBLEM</a>
NM	10/09/2015	D15	4	<a href="#">PROBLEM</a>
NM	10/12/2015	D15	4	<a href="#">PROBLEM</a>
NM	10/15/2015	D15	5	<a href="#">PROBLEM</a>
NM	10/18/2015	D15	6	<a href="#">PROBLEM</a>

Module B Field Blank

NM	10/15/2015	D15	8	<a href="#">PROBLEM</a>
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SUBMIT

EXIT

Module C

STATUS	SAMDAT	QTR	POS	PROBLEMS?
NM	09/01/2015	C15	41	<a href="#">PROBLEM</a>
EP	10/03/2015	D15	1	<a href="#">PROBLEM</a>
EP	10/06/2015	D15	2	<a href="#">PROBLEM</a>
NM	10/09/2015	D15	4	<a href="#">PROBLEM</a>
NM	10/12/2015	D15	4	<a href="#">PROBLEM</a>
NM	10/15/2015	D15	5	<a href="#">PROBLEM</a>
NM	10/18/2015	D15	6	<a href="#">PROBLEM</a>

SHOW COMMENTS

Figure 1: Post-sample Processing

PROBLEMS FOR LOG ENTRY 10/9/2015 MODULE C

**Hole:**

☐ Pinhole(s)      ☐ Middle

☐ Large      ☐ Outer edge

**Hole at download:**

☐ Small      ☐ Middle

☐ Large      ☐ Outer edge

**Dropped:**

☐ Sample side up      ☐ Counter

☐ Sample side down      ☐ Floor

☐ Small particles (A only)

☐ Insect / Large particles

☐ Scratches / Uneven sample

**Screen:**

☐ Double      ☐ Upside down

☐ Missing screen (terminal)

☐ Upside down filter (A, C, or D only)

**Notes:**

**OK**

Figure 2: Reporting problems

**Chart 1.** Filter Statuses

NM	Normal
QD	Questionable Data, process as Normal
PO	Power Outage
EP	Equipment Problem
NS	Not Serviced
BI	Bad Install
OL	Offline
XX	Invalid Sample

### *5.2 Organization*

- 1) Open the Lab app as explained above, select Post-sample Processing. Select a bin that appears in the queue and scan the barcode associated with the site. Always select sites from the queue unless directed otherwise by a lab tech.
- 2) Confirm that the bags are in numerical order in the bin, with week 1 in front to week 3 in back. Take the cartridges out of the week 1 bag and place them on the counter in order (A, B, C, D; or, red, yellow, green, blue). Make sure that the cartridges are oriented correctly so that position 1 is the bottom right cassette for each cartridge. Do the same for week 2, placing the cartridges behind week 1, then again for week 3.
- 3) Verify site name, the dates and position number from the Lab app match the cassette labels. This is to confirm that all cartridges were placed in the correct bag. If there is any concern that the dates are not in order, please let a lab tech know. Please also confirm that the cartridge configurations are correct for the cycle that the bin is on. Notify lab tech if cartridge configurations are incorrect.

### *5.3 Rearranging the Cassettes*

Yellow bins: Look at the cartridges in week 2. There should be a missing cassette in position 3 for each cartridge, A, B, C, and D. Now look at the cartridges in week 3. The third position cassette from week 3 is removable. It will be the only cassette attached with a black O-ring instead of a white C-clip. Pop the third position out of each cartridge of week 3 and insert them into the appropriate week 2 cartridge (A to A, B to B, etc.) in the open hole.

Blue bins: Look at the cartridges in week 1. There should be a missing cassette in position 3 for each A, B, C and D. Now look at the cartridges in week 2. The third position cassette from week 2 is removable. The third position cassette from week 2 is removable. It will be the only cassette attached with a black O-ring instead of a white plastic C-clip. Pop the third position out of each week 2 cartridge and insert them into the appropriate week 1 cartridge (A to A, B to B, etc.).

Immediately notify a lab tech if the configuration of the cassettes is incorrect.

### *5.4 Processing of Normal Nylon and Quartz Filters*

- 1) If there are any red highlighted statuses, please refer to the instructions below on how to handle problem statuses. If the Lab app indicates that all filter statuses are normal, please set the A and D cartridges aside. Remove all the red caps from the B and C cassettes and place the caps in the week 1 bag. Do not remove the red caps for A and D cassettes.
- 2) From this point forward, handle only one cartridge at a time. Start with the B cartridges and then move on to the C cartridges. If any field blanks are present, treat them in the same manner as other cassettes. Field blanks will have handwritten labels and should be put in either the B or C trays when processed, depending on filter type. NOTE: Field blanks should be placed in front of the first position filter when stacking petri dishes.
- 3) Remove the label from the first position B cassette from week 1 and place it on top of a clean Petri dish. Remove the bottom of the cassette using the arbor press and place the

filter that lies in between the bottom of the cassette and the screen into the Petri dish. Close the Petri dish. If necessary, use the unlabeled forceps for the B filters. As the filters are processed, stack the Petri dishes from the earliest date (on the bottom) to the latest (on top). Proceed to process all of the B filters in this fashion for all three weeks. Then, place the Petri dishes into the tray marked for B filters (nylons). The proper order of placement in trays is left side first from top to bottom with the oldest date placed in first. Again, field blanks should be placed in front of the first position of that week. If the tray is filled, continue with the Nylon Inventory instructions below.

- 4) Clean all of the cassette bottoms and fixed screens using ethanol and Kimwipes™. Also make sure to clean the cartridge plate.
- 5) Process the quartz filters in the same order as the nylons. Note that the quartz cassettes have loose screens, so when the cassette bottom is inverted, both the filter and the loose screen will come out. Place the loose screens in the used quartz screen container, which is on the counter at the Post-sample Processing station. Ensure that the filters end up in the correct Petri dish.
- 6) Clean the C cassette bottoms and cartridge plates with Kimwipes™ and ethanol. If there is a lot of quartz residue on the cassette bottom, take the quartz brush and brush the cassette bottom while holding it over a garbage can. This ensures that no quartz residue gets on the counter. Then wipe the cassette bottom with ethanol and a Kimwipe™. As mentioned previously, discard Kimwipes™ after the C cartridges have been cleaned. Stack the Petri dishes with processed filters in the same fashion as the B filters and place them in the tray marked for C filters (quartz). If the tray is full, follow the instructions below for Quartz Inventory.
- 7) Stack cartridges from each of the three weeks in pairs: A +D and B+C. Place them back in their corresponding bags. B and C cartridges should be in the bottom of the bag and the A and D cartridges on the top. This makes it easier for the person at the Post-sample Weigh In station.
- 8) If a filter is dropped or punctured in any way, then report the problem by selecting the correct problem(s). Make sure to the correct sample date, and medium of the filter was selected. If it was dropped, select sample-side up or sample-side down and counter or floor.

#### *5.5 Handling of Problem Cassettes*

- 1) If any statuses within a bin are highlighted in red, take a red pen and write the problem status abbreviation (ex., PO) directly on the label(s) belonging to the problem cassette(s). Make sure the proper cassette is identified by double-checking the sample date and the cartridge letter with the Lab app. If there is a field blank that shares a date with a regular filter that has a problem status, then the field blank is considered a problem as well and must be labeled as such.
- 2) Once all problem cassettes are labeled, proceed with processing the problem filters. To begin processing the problem cassettes, handle only one cartridge and cassette at a time. Start with the oldest date and the earliest letter.
- 3) Move the label from the first cassette to the top of a clean Petri.
- 4) Remove the bottom of the cassette using the arbor press. For the Bs, place the filter into

the Petri dish and close. For Cs, invert the cassette bottom to remove the filter and the loose screen. Place the loose screens in the appropriate container. Loose screens for Cs go in a container at the Post-sample Processing station. The A and D problems are weighed at the Post-sample Weigh In station.

- 5) Clean the cassette bottom with ethanol and a Kimwipe™. If it is a B cassette, make sure to clean the fixed screen as well. Remember not to use Kimwipes™ that were used on a quartz cassette on a cassette of any other filter type.
- 6) Repeat steps 3-5 for every problem B or C cassettes in the bin.
- 7) Once all problem filters have been processed, then place Petris in the Problems tray. Make sure to fill the left side of the tray first, from back to front. Oldest filters should be placed in first, going from B to C. Problem field blanks should go in after the associated filter.
- 8) If either tray is full, refer to the appropriate inventory instructions below.
- 9) Continue with the Post-sample Processing procedure for normal B and C cassettes in the manner described in the previous section.

#### *5.6 Preparing Trays for Inventory*

If any tray is filled, start inventory preparations by finding an empty Petri tray. Empty trays are typically found between the Post-sample Processing station and the Cartridge preparation station. Find six small round stickers to use to label the tray. For nylons (B), the stickers should be yellow. For quartz (C) filters they should be green. Problems and FB problems used to be color- coordinated by quarter (A=red, B=yellow, C=green, D=blue), but starting in 2013 problem trays are now labeled with pink stickers to avoid confusion with A and D Teflon® filters. Four stickers will be used on top of the tray and two will be placed on the side (Figure 3). The top left sticker should be labeled with the number 1 and the top right sticker with the number 26. Both of these stickers should have a downward pointing arrow written after the number to indicate the order of the Petri dishes. The bottom left sticker needs to be labeled with the four digit year and the bottom right needs to be labeled with the identification number(s). These last sticker labels are repeated and placed on the side of the carton, directly under their corresponding stickers. Please note starting September 2014, the inventories are arranged by year instead of seasonal quarters.

#### *5.7 Identification Numbers for "B"s and "C"s*

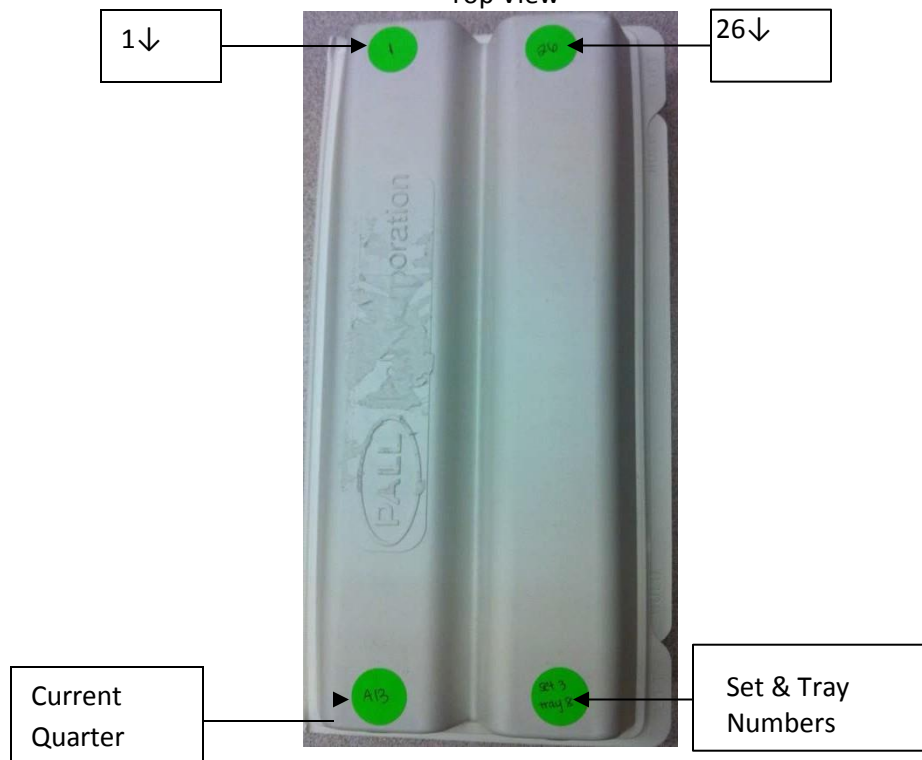
The identification numbers for B and C trays are the set number and tray number. To find out what set and tray number to label the tray with, open the Excel file Traycheck Lists.xlsm, the information for the last tray inventoried is located on the upper left hand corner of the sheet. If the tray number on the previous carton is seven or less, copy the set number and add the next sequential tray number to the stickers, then place them on the carton. If the previous carton is labeled as tray 8, the current carton is the start of a new set. Label the carton's stickers with the next sequential set number and the tray number will be 1.

#### *5.8 Identification Numbers for Problems Trays*



The identification numbers for Problems are based on the year. Trays start at #1 and continue sequentially until a new year starts, when the tray number will start back at #1 again.

**Figure 3. Properly Labeled Filter Trays**  
Top View





### 5.9 Tray Checking

Once labeled, all trays need to be tray checked.

To find the macros for the Bs, Cs, and Problems, click on the "Traycheck Lists.xlsm" file located on the desktop on the Post-sample Processing computer.

### 5.10 "B" Contractors

Once the Excel file is open, click on the yellow "B" icon in the middle of the open workbook to get a tray check list for the nylon filters. The program will display a prompt for the proper year (ex. 2015) and the filter set number (1-52). Once this information is entered, a master sheet will be brought up as well as the tray lists for the set (labeled B\_Sheet\_1, etc.). Each sheet number corresponds to a tray number. Click on the appropriate sheet and begin tray checking. Move the Petri dishes in the nylon filter holder over to the newly labeled carton in the order given by the sheet. Notify a lab tech, complete trays must be stored in the chemistry lab fridge.

### 5.11 "C" Contractors

For the quartz filters, click on the green "C" icon in the "Traycheck Lists.xlsm" Excel file. Enter the proper year and filter set number. Once this information is entered, a master sheet will be brought up as well as the tray list for the set (labeled C\_Sheet\_1, etc.). Each sheet number corresponds to a tray number. Click on the appropriate sheet and begin tray checking. Move the Petri dishes in the quartz filter holder over to the newly labeled carton in the order given by the sheet. NOTE: As of December 2014, IMPROVE network no longer requires double C sites.

### 5.12 Problem Filters

Click the ☺ icon in the top row of the 'Trayfile Lists.xlsm' Excel file. Enter the proper year and the tray sheets will be generated. Completed trays are placed on top of the shelves at the Post-sample Processing station. The problems will include "A", "B" and "C" filter dates with an associated field blank for the given filter type. The "A" problem filters must be weighed first

and will be located in a tray next to the Post-sample Weigh In station.

**TI 251G** Post-sample Weigh In

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## **1. PURPOSE AND APPLICABILITY**

The purpose of this SOP is to describe the procedures used to process sampled Teflon® filters and prepare them either for further analysis or for storage. Procedures listed are applicable to all routine filters.

## **2. SUMMARY OF THE METHOD**

Once all nylon, quartz, and their associated problem filters have been removed from a bin, it is ready to be Post-sample Weigh In. Sampled Teflon® filters and all problem filters are weighed on a microbalance and their post-weights are recorded using a custom designed application “Improve Filter Processing” (Lab app). “A” filters are prepared for further analysis, and “D” filters are prepared for permanent storage.

## **3. CAUTIONS**

Many site names are similar. It is important to ensure that the site being loaded in the “POST” program matches the site name on the bin.

Make sure to handle only one cassette at a time. Having two or more cassettes open while processing filters increases the risk of filter swaps.

Sometimes the loose screens stick to the filters. Try gently holding the filter and screen with one pair of forceps while trying to separate them with another pair of forceps. Ask a lab tech to separate them if there is concern about tearing the filter.

Sometimes filters are accidentally loaded upside-down so the sample is on the wrong side of the filter. Make sure to weigh the filter sample side up, even if the sample is on the incorrect side. Also make sure to place the filter in the Petri sample-side up. If a filter has sample on the wrong side, note this in the Lab app and notify a lab tech.

Make sure when logging into the Post-sample Processing computer to use the correct login information. It is posted on the computer.

## **4. EQUIPMENT AND SUPPLIES**

- Microbalance
- Computer with “Improve Filter Processing” balance application
- Antistatic unit
- Forceps with ceramic tips
- Polonium strips (small and large)
- Container for used loose A and D screens
- Clean Petri dishes
- Clean slides
- Designated “A” Petri trays and “D” slide trays

## **5. PROCEDURE**

- 1) There are two microbalances, find the one assigned “Post-sample Weigh In” station, which

is next to the "Cartridge Preparation" station. The balance at this station is Mettler 1. Make sure to enter the correct username and password when logging in to the "Post-sample Weigh In" computer. Login information is posted by the computer. In front of the balance are several polonium strips. They will be used as placeholders for the filters before weighing.

- 2) From the desktop open "Improve Filter Processing" application, select Post-Sampling then click on Post-sample Weigh In.
- 3) Enter three letter initials into the program. A pop up window will list the sites in the queue on the left column. Review the queue, and then select a site bin from the shelf in the "Post-sample Weigh In" cabinet. Ensure the cursor is blinking on the right column of the pop-up window, and then scan the barcode associated with the site. Notify a lab tech if the site bin does not have an associated barcode. Always select a bin from the queue unless directed otherwise by a lab tech.
- 4) Each bin has three re-sealable bags labeled Week 1, Week 2, and Week 3. Each bag should contain four cartridges. "A" and "D" cartridges should be the only cartridges with cassette labels. Ensure that the dates on the "A" and "D" labels fall within the week listed on the bags and that the site codes on the bag and cassette labels correspond. EXCEPTIONS: Main-X boxes and C-only sites will differ from this. Main-X boxes will have an additional three bags with one cartridge in each. If the X module is an "A" or a "D," check the dates and site code on the labels. Single-C sites (PITT1, ATLA1, and DETR1) will only have one cartridge in each bag and all filters and associated cassette labels should already be removed.
- 5) If the bin is not a single-C site, continue on to step 6. If the box is a single-C site, then a list of all dates processed in the previous station will appear on the screen. Read the instruction on the screen. Then press "SUBMIT" located at the bottom of the screen. Must process the bin through the station even though no filters will be weighed. Then place the bin on a shelf in the "Cartridge Preparation" cabinet.
- 6) Visually check the bubble level on top of the Mettler balance and be certain that the inner bubble is centered within the outer black circle. If the bubble level is not centered, immediately inform a lab tech so that they can perform an adjustment.
- 7) Check the gauss meter reading before and during weighing. It is important to ensure the gauss meter reading is stable and not fluctuating more than  $\pm 0.2$ . Gauss meter measures the magnetic field emitted by the Cyclotron which affects the electronics of the balances and can result in incorrect weights.
- 8) Check that the reading on the balance display is 0.000mg. Unstable weights have blue numbers as well as the indicating circle on the terminal display. Stable weights are indicated by black numbers without any displayed indicating circle. If the reading is stable and is not 0.000mg, immediately inform a lab tech and do not proceed with any weighing until instructed to do so.
- 9) Make sure that the antistatic unit is turned on.
- 10) The lab app will display all the sampling dates within a bin, however only remove the "A" and "D" cartridges from the Week 1 bag. Remove the red caps from the "A" cartridges and place them in the Week 1 bag. All red caps removed during the post-sample weighing should go into the Week 1 bag to simplify the processing of clean filters in cartridge preparation and pre-sample weigh in stations.
- 11) Remove the label from the first sampled cassette in the "A" cartridge and place it on a

clean Petri dish. The first sampled position will be the first position in the cartridge. All filters must be weighed regardless of status.

- 12) Open the first sampled cassette with the arbor press. Overturn the cassette bottom over the polonium strips. There should be a loose screen and a filter in each cassette bottom. Remove the loose screen and place it in the labeled container for used screens. If the screen sticks to the filter, try holding the filter with one set of forceps while trying to separate the two with another pair of forceps. If there is concern about ripping the filter, ask a lab tech to separate them. Note: only open one sampled cassette at a time. Make sure to orient the filter so that it rests on the polonium strip sample-side up. The filter will be sample-side up when it comes out of the cassette bottom. Note that typically the sample is on the “dull” side of the filter (looking at the outer support ring); or, in other words, the opposite side of the filter as the barcode. This is the proper orientation. Sometimes a filter is loaded upside-down and the sample is on the same side of the filter as the barcode, or the “shiny” side (looking at the outer support ring). It is important to note this in the lab app and to weigh and store the filter sample-side up.
- 13) Closely inspect the filter. Filters can have a variety of problems, all of which must be reported to a lab tech. The standard procedure for reporting filter problems involves reporting the problem in the lab app see a-i below for further details. Click on the “problems?” button for the correct module and sample date.
  - a. Hole: refers to existing rips or holes (filter was damaged prior to current station), then select a hole size, pinholes are the size of a needle or smaller. Large hole are anything bigger than a pinhole. Next select hole location, if the hole in the middle of the filter or the outer edge. Notify a lab tech if large hole and “NM” status.
  - b. Hole at download: the filter was damaged at the current station. Select, a hole size. Small is the size of the tip of the forceps. Next select a location. Notify a lab tech if was damaged by a large hole.
  - c. Dropped: If a filter is dropped on the counter or on the floor, it should be reported on a status adjustment sheet. Indicate whether it fell sample side down or sample side up Make sure to select both where the sample fell and the sampled side.
  - d. Small particles (A filter only): select if visible particles on this filters and notify lab tech.
  - e. Insect/Large particles: select if bugs or large particles are visible. If present on “A” filter notify lab tech immediately. If present on “D” filter, then remove the bug without damaging filter, ask lab tech for help if necessary. Next, weigh the filter. If large particles do not remove before weighing.
  - f. Scratches/Uneven sample: select if specks, un-sampled regions, or a patterned sample (on A’s only): The color of any speck on a filter should also be noted (usually white or black). Note if there are multiple specks.
  - g. Screen: select “Double” if more than one screen present, select “Missing” if no screen present, and select “upside down” if screen was loaded on the wrong side.
  - h. Upside down filter: select if the sample is on the shine side instead of the dull side.
  - i. Filters can have problems with their weights that need to be noted. The lab app will automatically validate weights. If the weight is a negative value, zero, or higher than 1.000mg then a popup message will appear, notify Lab tech immediately. The only

exception to this is field blanks; field blanks can be in a range of  $\pm 0.005$ , if weight difference is greater than a popup message will appear, notify lab tech immediately. Also, if an "A" filter has a greater mass difference than a "D" filter, a pop-up message will appear, notify lab tech immediately..

- j. Anodized Dust (D filters only): Anodized dust looks like wispy dark specks on the filter. , Alert a lab tech immediately if anodizing dust is suspected.
  - k. Peeling/Flaking: if sample is uneven due to sample peeling or flaking, notify lab tech. Peeling will typically occur at the edge of a filter. Sample loss due to flaking occurs when sample is dry.
  - l. Water spots: notify lab tech if water spots are present.
  - m. Finally, if there is anything not listed above that is found on the filter and is abnormal, make sure to notify lab tech.
- 14) Open the draft shield of the balance by pressing the right arrow button on the balance terminal. Slowly pass the filter through the ionizing zone of the antistatic unit and gently place the filter onto the balance pan. Close the balance door by pressing the same arrow key.
  - 15) Once the filter is on the balance, follow the screen prompts given by the lab app and wait for a stable weight (black numbers without any displayed indicating circle will appear on the balance display). The lab app will automatically query the balance and take a weigh, press "A" to accept it. If the weight is incorrect, press "R" on the keyboard to refresh the value and the lab app will pick up a new weight.
  - 16) After the proper weight is recorded, remove the filter from the balance with forceps. Place the "A" filter sample-side up into the labeled Petri dish and put it into the "A" filter Petri tray. Re-attach the cassette bottom and top using the arbor press.
  - 17) Repeat steps 11-17 for all "A" filters in the week.
  - 18) For "D" filters, the process is identical except that the filters are placed in the "D" filter slide tray for that site.
  - 19) Occasionally, there will be a field blank in one of the cartridges. After measuring the routine "A" and "D" filter weights, the computer will display a prompt to weigh the field blank. If this value has a difference greater than  $\pm 0.005$  from its pre-weight, notify lab tech.
  - 20) The lab app will automatically move to the second week in the bin. Place the week 1 cartridges back into week 1 and remove the "A" and "D" cartridges from week 2. Repeat steps listed above until all three weeks have been processed.
  - 21) Review the weights at the end of box. If any changes need to be made, move the cursor to highlight the weight to be modified. Ensure the correct sample date was selected and reweigh the filter. Repeat as necessary, notify lab tech if any issues.
  - 22) Select "submit" when finished. If bin contains an associated X-site then go to step 24. If no X-site present then continue to step 25.
  - 23) An associated X box will be process immediately after the main box. Next scan the associated x-site barcode into the lab app. If the X box is an "A" or a "D," process the filters as described above. If the X box is a "B" or a "C," follow then select "submit no weighing is necessary.
  - 24) After site has been processed through Post-sample Weigh In, then move the bin to the "Cartridge Preparation" cabinet.
  - 25) If any tray is filled, close the already-labeled tray and place it on a lab technician's desk. Then,



find an empty Petri tray. Empty trays are typically found in the between the Cartridge Preparation station and the Post-sample Processing station. Begin inventory preparations for the next tray by finding six small round stickers to use to label the tray. For “A” filters, the stickers should be red. Four stickers will be used on top of the tray and two will be placed on the side. The top left sticker should be labeled with the number 1 and the top right sticker with the number 26. Both of these stickers should have a downward pointing arrow written after the number to indicate the order of the Petri dishes. The bottom left sticker needs to be labeled with the year and the bottom right needs to be labeled with the tray and set number. These last sticker labels are repeated and placed on the side of the carton, directly under their corresponding stickers.

## **6. DATABASE MANAGEMENT**

The IMPROVE Filter Processing application (lab app) that accesses the SQL database to develop a list of exposed filters to be processed from cassettes. Next, it queues the exposed filters for weighing, and it records post weight values from the microbalance into the WEIGHTS table. Finally, after processing is finished, it notes that the record is complete in the LOGS table.

**TI 251H** Cartridge Preparation Station

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## **1. PURPOSE AND APPLICABILITY**

This SOP details the procedures used for the Cartridge Preparation station in the sample handling laboratory and establishes uniform guidelines for how to perform these tasks. These instructions are applicable for any IMPROVE network site box.

## **2. SUMMARY OF THE METHOD**

The Cartridge Preparation station is the first in the process of loading a bin to be sent back out into the field. Cartridges are checked for proper orientation. "A" and "D" cartridges are cleaned and all cartridges are labeled with fresh stickers for the new cycle. "B" and "C" filters are loaded, a flashcard is assigned, and field blanks are designated if necessary.

## **3. DEFINITIONS**

- Dummy: A placeholder used for cassette positions that are not sampling positions and do not contain filters.

## **4. CAUTIONS**

When loading quartz filters, it is important to load a single screen in each cassette. Failure to load a screen at all or loading two screens instead of one can severely affect sampling out in the field.

Some sites have very similar names. It is important to use the correct stickers when labeling cartridges and week bags so that no confusion occurs at later stations or in the field.

## **5. EQUIPMENT AND SUPPLIES**

- Ethanol
- Ethanol wash bottle
- Kimwipes™
- Labeled Compact Flashcard
- Bins with empty cartridges
- Computer with Lab Application
- Barcode scanner
- Week stickers (with site name and installation date)
- Cassette stickers (with site name and sample date)
- Sharpies (red, yellow, green, blue, black)
- Necktie stickers (A,B,C,D)
- Dot stickers (red, yellow, green, blue)
- Blank cassette stickers
- Black pen
- Clean 6 mil re-closable bags
- Pre-labeled 6 mil re-closable Week bags

- Container of clean quartz screens
- Designated quartz forceps
- Stainless steel forceps for nylons

## 6. QUALITY CHECK PROCEDURE

### 6.1 General Information

Bins ready to go through the Cartridge Preparation station are placed in the open cabinets right of the Post-sample Weigh In cabinet.

Bins go through the Cartridge Preparation station according to priority. Yellow-label bins are generally higher priority than green-label bins. The only exceptions to this are if a yellow-label bin is late and its replacement has already been shipped, or if the bin belongs to one of two sites that install cartridges on Thursdays. These two sites are BALA1 and WHPE1, which are permitted to go out after the green-label bins. Bins with pink or white labels will have three or more boxes in circulation, and are lower priority.

### 6.2 Cleaning the “A” and “D” Cartridges

The first step at the Q/A station is to remove the stickers from the week bags and then dispose of them. Remove all cartridges from the three week bags and line them up by week. Place the B and C cartridges to the side, keeping them paired by week. These cartridges have already been cleaned at a previous station. The A and D cartridges have had their cassette stickers removed at Post-sample Weigh In, but the cartridges need to be cleaned. If the site has an X module that is either an A or a D, its cartridges will need to be cleaned as well.

- 1) Please remove the cassette bottoms from each sampling position and any other position that does not have a “dummy” in it (FB positions, if one was loaded).
- 2) Clean all cassette bottoms. The inner lip needs to be thoroughly cleaned to remove any sample peel and to prevent filters from sticking to the cassette bottoms.
- 3) Please remove all sticker residues from the cartridge plates. Use as much ethanol and as many Kimwipes™ as necessary.

Perform a quick inspection of the B and C cartridges to make sure that they have been cleaned thoroughly. Wipe down any cartridges that need it.

### 6.3 Quality Check of the Cartridges

Be able to recognize which cartridges (A-D) should be in which bag. Make any necessary corrections. Lists of how cartridges should be configured for each cycle type are below:

#### 2-3-2 Yellow-bin Boxes

- Week 1: All 4 C-clip positions, with neckties on positions 1 and 2.

- Week 2: C-clip positions in positions 1 and 2, with an O-ring cassette in position 3. These 3 positions should have neckties. Position 4 should have a C-clip position with no necktie.
- Week 3: C-clip positions with neckties for positions 1 and 2. There should be an open hole in position 3 (no cassette). Position 4 should be a C-clip position without a necktie.

### 3-2-2 Blue-bin Boxes

- Week 1: C-clip positions for positions 1 and 2, with an O-ring cassette in position 3. These three positions should have neckties. Position 4 should have a C-clip and no necktie.
- Week 2: C-clip positions with neckties for positions 1 and 2. There should be an open hole in position 3 (no cassette). Position 4 should be a C-clip position without a necktie.
- Week 3: Week 1: All 4 C-clip positions, with neckties on positions 1 and 2.

### 6.4 Week Bag Check

- 1) Please check that week bags are presentable. They should be clean and without holes.
- 2) If unsure about a week bag, it is safer to replace it.
- 3) Pre-labeled week bags are located on a shelf at the Cartridge Preparation station. If there are none, make more using fresh 6 mil re-closable bags and a black Sharpie.

### 6.5 Necktie Check

- 1) Please check that there are clean neckties on all sampling positions (not on field blanks). Replacements for all A, B, C, D, and X neckties can be found on a shelf at the Q/A station.
- 2) If any necktie is fading or falling off, replace it. Please clean the cassette “neck” with ethanol and a Kimwipe™ before applying the sticker.

### 6.6 Access the Lab Application

- 1) Open the Lab Application. Navigate to Pre-Sampling, and then Cartridge Preparation, entering three-letter initials if necessary.
- 2) Scan the bin barcode (type in the 5-character site code if the bin is unlabeled).
- 3) Select a Field Blank if the quota is not met. Otherwise select “None”.
- 4) In a cardboard tray at the Cartridge Preparation station, find the flashcard associated with the site. If the 8-digit serial number is listed on the left column, select it. Otherwise please confirm with an authorized lab technician before entering a new card number.

### 6.7 Sticking Bags and Cartridges

- 1) Bag and cassette stickers for all sites can be found in the filing cabinet below the counter that is next to the Post-sample Weigh In balance (Mettler 1). If any stickers are missing, ask a lab tech to print new ones.
- 2) Verify that the Cartridge and Bag stickers match the dates listed by the Lab Application. If they do not, contact an authorized lab technician. A line divides each week. SAMDAT (Sampling Dates) appear in the correct order of oldest at the top, to more-recent at the bottom, and Status, QTR (Quarter), and POS (Quarter-Position number) for each SAMDAT should match, for each filter type
- 3) Please place the appropriate bag label on each week bag. They are site and week specific.
- 4) Please sticker all cartridges. Sticker Wk 1→Wk3, POS 1→POS2, etc. for the appropriate filter type. Please only sticker cartridges one week at a time to avoid mix-ups and confusion.
- 5) Determine whether or not a field blank needs to be loaded.
  - a. If no field blanks need to be loaded, continue to 6.
  - b. Please make the appropriate FB label. Blank FB stickers are located at the Cartridge Preparation station. Label the sticker with the information reflected by the Lab Application (with the appropriate site, FB filter type, and sample date (the same sample date as the filter in position 1 of the appropriate week)).
  - c. All field blanks are always in position 3. Field blanks are located in week 1 for yellow-bin (2-3-2) boxes and should have the same sampling date as the first position for that week. Blue-bin (3-2-2) field blanks are located in week 3 and should match the sampling date of position 1 for that week.
- 6) After bag and cassette stickers are used, please leave them in the appropriate desk tray on the shelf at Cartridge Preparation station. These will need to be returned to the filing cabinet at a later time.

#### 6.8 "Dummy" Check

- 1) All positions without a necktie should have a correctly-colored "dummy" set. The "dummy" for the "A" cartridge is a thin, clear plastic disc and a circular red piece of construction paper. The clear plastic disc is placed in the cassette bottom, followed by the circular piece of construction paper. The "dummy" for the "C" and "D" cartridge follows the same procedure except that the construction paper circle is green or blue instead of red. The "B" "dummy" consists of two white circular papers with blue type spelling "PALL" written on one side. The papers are placed type-side down into the cassette bottom.
- 2) If a field blank was designated and a field blank sticker was placed on the cartridge, remove the "dummy" set from that position. Clean the cassette bottom to prepare it for loading.
- 3) If a field blank was loaded previously but is not being loaded in the current box, please fill that position with the appropriate "dummy" set. If it is an "A," "C," or "D" cassette, please also make sure to put a correctly-oriented loose screen on top of the "dummy" set.

## 7. PROCEDURE FOR LOADING NYLON AND QUARTZ FILTERS

The second part of the Cartridge Preparation station is loading B and C filters.

- 1) Find the two sets of forceps needed for B/C filter loading. One will be unmarked and is used for nylons. The other will be marked with a green sticker or tape at the bottom and is used exclusively for C filters.
- 2) There should be a box of nylon filters and a box of quartz filters at the station. If there aren't any, please notify a lab tech so that they can check out a new box. These filters are both stored in Room 116. The nylon filters are in a fridge and the quartz filters are in a freezer in this lab.
- 3) Remove all red caps from the Week 1 bag. Stack the A and D cartridges, keeping them together by week. These will not be loaded until the next station. Line up the B and C cartridges according to week.
- 4) Loading B filters: Open up the cassettes for all the sampling positions in the first week. Use a pair of unmarked forceps to remove the B filters from their container. The filters are white and there are pieces of paper with the PALL logo on them to separate the filters. Throw away the papers. The B filters do not have any orientation. Simply place one in each cassette bottom. After loading a filter, close the cassette by putting the cassette bottom and top into the arbor press and then pushing up on the lever to close them together. When all filters for a cartridge have been loaded, put red caps on all cassette bottoms.
- 5) Loading C filters: Open up the cassettes for all sampling positions. Use a pair of C forceps to remove the quartz filters from their container. These filters do not have any paper to separate them. Be sure to take only one at a time. The C filters have a proper orientation: the roughest side must be facing up in the cassette bottom. Once a filter has been loaded into a cassette bottom, use forceps to pick up a loose C screen from the container at the Q/A station and place it on top of the filter. Make sure the screen is oriented so that the side with the engraved "UP" is facing up out of the cassette. When the cassettes have been loaded with filters and screens, close them and put the red caps on.
- 6) Repeat all loading procedures for all B and C cartridges. When all B and C filters have been loaded and capped, return them to their appropriate week bags, along with the A and D cartridges. Place all remaining red caps in the Week 1 bag and move the bin to the "Pre-sample Weigh-in" cabinet.
- 7) Specialty Cases:
  - a. Field Blanks: Make sure to load an extra B or C filter if a week has a designated B or C field blank in one of the weeks. B or C field blanks will always be in the third position and are found in week 1 for yellow-bin boxes and week 3 for blue-bin boxes.
  - b. 1-X sites: Some sites have an X module. This means that a site will have three bags with four cartridges in each, followed by another three bags with only a single cartridge per week. The X module can be any filter type. If it is an A or a D, no further work needs to be done. If it is a B or a C module, make sure to load the cassettes with the appropriate filter type. Note: Unfortunately, A, B, C, or D cartridges in X site bins are all labeled with an orange dot sticker and "X" neckties. To identify the appropriate filter type, refer to the Lab Application and confirm with the X mod cassette and bag labels.

## **8. SUBMIT RECORDS**

Please re-check all neckties, stickers, “dummies,” bags, and cassette organization, then submit the records through the Lab Application.



**TI 251I** Pre-sample Weigh-in

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## **1. PURPOSE AND APPLICABILITY**

The purpose of this SOP is to describe the procedures used to weigh and install clean “A” and “D” Teflon® filters to be sent back out into the field. These procedures are used for every site in the IMPROVE network, though many of them generally apply to special studies as well.

## **2. SUMMARY OF THE METHOD**

Clean Teflon® filters are weighed on a microbalance. The weights are recorded using the Lab Application. Teflon® filters are loaded into labeled cassettes. Log sheets are generated, one for each week. Bins are then ready for the Quality Check station.

## **3. CAUTIONS**

Many site names are similar. It is important to ensure that the site being loaded in the Pre-sample Weigh-in program matches the site name on the bin.

Make sure to handle only one cassette and one filter at a time. Having two or more cassettes open while loading filters increases the risk of filter swaps.

When loading Teflon® filters, it is important to place a single screen in each cassette. Failure to load a screen at all or loading two screens instead of one can severely affect sampling out in the field.

Make sure to use the correct login information at the Pre-sample Weigh-in computer. The username and password are posted on the computer.

## **4. EQUIPMENT AND SUPPLIES**

- Microbalance
- Computer with Lab Application
- Barcode scanner
- Antistatic unit
- Forceps with ceramic tips
- Container of clean 25mm loose screens
- Polonium strips (small and large)
- Clean Teflon® filters
- Printer
- Log sheet paper
- Extra red caps

## **5. PROCEDURE**

- 1) There is one assigned “Pre-sample Weigh-in” station, which is the Mettler 2 (A-182) balance. In front of the balances are four to six antistatic polonium strips. There should be one set of forceps to be used for the Teflon® filters. Make sure to use the correct login information at the station. The username and password are posted on the computer at the station.

- 2) Remove the Teflon® filters from the box and line up as many as possible on the polonium strips. Use the forceps, making sure to grab the filters by the plastic edge. Throw away the clear plastic circles that are on the top and bottom of each stack of filters.
- 3) Open the Lab Application. Navigate to Pre-Sampling, and then Pre-sample Weigh-in, entering three-letter initials if necessary. Scan the bin barcode (type in the 5-character site code if the bin is unlabeled).
- 4) The cartridges should have already been stickered by the time the bin gets to this station. Remove the "A" and "D" cartridges from week 1 and ensure that the cassette labels on the cartridges match the sample dates shown on the computer screen. Verify that the Cartridge and Bag stickers match the dates listed by the Lab Application. If they do not, contact an authorized lab technician. A line divides each week. SAMDAT (Sampling Dates) appear in the correct order of oldest at the top, to more-recent at the bottom, and Status, QTR (Quarter), and POS (Quarter-Position number) for each SAMDAT should match, for each filter type
- 5) Make sure that the balance reads 0.000mg. If it does not, please tare the balance by pressing the tare button (<0>) on the balance. Check the level bubble at the top of the balance. If the bubble is outside of the circle, please ask a lab tech to level it before continuing. Confirm that the gauss meter readings do not fluctuate more than 0.3 from the lowest to highest value.
- 6) Wait for the Lab Application to accept the tared weight. Take the forceps and pick up a Teflon® filter from the polonium strips. Look at the filter. Make sure that there are no holes. If a speck can be seen on the filter, try to flick it off by tapping the edge of the forceps. If the speck will not come off, place it in the box on the weight table that is labeled, "Specks." If a hole is found, place it in the box labeled, "Holes." If the filter is dropped or injured in any way due to handling, place it in the "Dropped" box.
- 7) Ensure that the filter is oriented correctly. There are two sides to a Teflon® filter. The ring on the outer rim of the filter is shiny on one side and has a barcode on it, while the other side is dull and has nothing written on it. Make sure to pick up the filter so that the dull side is facing up. Pass the filter through the antistatic unit on the right side of the balance. Open the balance by pressing the right arrow button. With the wrist remaining within the ionizing strip's effective zone, gently place the filter on the pan shiny side down and press the same button to shut the door.
- 8) The top row in the A channel column with the first sample date row will appear highlighted. Therefore, the filter that is being weighed belongs to position 1 of the A channel. There will be an area for text to the right of the weights box that will say "Waiting for stable weight." While waiting for the balance to stabilize, open the first position of the physical "A" cartridge. Do so by putting the cassette in the arbor press and pulling down on the lever. Take the cup from the bottom of the press and set it next to the polonium strips. When the filter weight is stable, the program will pick up the weight and display it in the green box.
- 9) After the filter's weight stabilizes and a weight is displayed, the text area will offer several options: [A] to accept and continue; [R] to discard and retry. Check to make sure that the weight the balance display reports matches the number on the computer monitor. If the

two numbers differ, then press [R] to discard and retry. If the weights match, press [A]. The text area will confirmed that the weight is saved. Remove the filter. Open the balance door and gently grab the filter (again by its outer edge) with the forceps. Set the filter down into the cassette bottom that is in front of the polonium strips. Make sure that the filter is shiny side up in the cassette bottom—the barcode should be visible and read correctly by looking into the open cassette bottom. This means that the filter must be flipped over between removing it from the balance and placing it into the cassette bottom. The proper orientation is extremely important. Then, retrieve a clean loose screen from the container on the weight table and place it on top of the filter. Make sure the side with the engraved “UP” is facing up in the cassette cup. Make sure to load only one, as they can sometimes stick together.

- 10) The program will wait for a stable zero weight from the balance. Manually press the tare button on the balance (<0>) to return the balance to its true zero if it fails to do so by itself. After, the program displays “Waiting for stable weight” in text area, place another filter on the balance. Now the space for the second position “A” filter will be highlighted. Pick up another filter and place it on the balance. Be sure to close the balance door. The computer will automatically start waiting for the balance to stabilize. Filter are weighted by week, with A filters weighed first in order of earliest to more recent sampling dates, the D filters in that same order. Proceed with the rest of the filters in the box.
- 11) Make sure while weighing that all weights in a week are  $\pm 0.100\text{mg}$  apart from each other. The program will perform this check and prompt for a replacement weight when necessary.
- 12) When all three weeks are complete, the Lab Application will offer the chance to change a weight. Whenever replacing a weight at the end of a box, contact an authorized lab technician and complete a PreWeight adjustment form. Next, submit records and retrieve the log sheets for the box from the printer. The site name is printed in the center at the top of each log sheet. Confirm that the log sheets match the site that was just loaded. Fold the log sheets in half lengthwise, then widthwise and place them in the correct weeks. Place the completed bin in the cabinet at the “QC Check” station.
- 13) Special Case #1: X-boxes. Some bins will have an additional three bags with a single cartridge in each. These cartridges need to be loaded directly after the main site. Scan the barcode for the “X” site, or otherwise type in the five-letter site code. If the X MOD is an A or a D, load the filters as described above. If it is a B or C, submit records and the log sheets will print. Remember that nothing is being weighed; this process updates the Logs database that a new box has been loaded.
- 14) Special Case #2: C-only sites. C-only sites (DETR1, ATLA1, and PITT1) will not need to have any filters weighed at the load station. Simply submit records to print the log sheets.

## 6. DATABASE MANAGEMENT

The Lab Application is used to load filters that will be sent out into the field. The program checks the Logs and Weights databases to determine the sample date of the last filter weighed for each site. The Lab Application then determines the next seven sample dates required at each site.

IMPROVE Sample Handling Laboratory

SOP 251: Sample Handling

TI 251J: Quality Check Station

Date: November 1, 2015

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**TI 251J** Quality Check Station

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## **1. PURPOSE AND APPLICABILITY**

The purpose of this SOP is to describe in detail the procedures used at the Quality Check station in the sample handling laboratory. It is applicable to all routine filters in the IMPROVE network.

## **2. SUMMARY OF THE METHOD**

Once all cartridges of a bin have been loaded with new filters, the bin goes through a final check to make sure that all filters and cartridges are suitable to be shipped out. Log sheets are examined for mistakes and the flashcard number is confirmed. Any issues are remedied. Shipping labels are printed out and placed in the bins. The bins are placed onto a rack and eventually transferred to the designated shipping/receiving area for the sample handling lab in the IMPROVE shop to be packed and shipped out.

## **3. CAUTIONS**

Many site names look similar. It is important to make sure to print out the correct UPS label for each site so that they are sent to the correct place.

Remember that United States Postal Service (USPS) sites have a white site label on their bins.

Remember to staple the return label to the Week 3 log sheet and place the outgoing label in the bin. Sometimes these labels are accidentally swapped and the box ultimately ends up back at the lab instead of its proper destination. This can cause loss of sample out in the field and is to be avoided.

Double-check each cassette in every A, C, and D cartridge to make sure that a single loose screen has been loaded in each cassette. Multiple screens or no screen can affect the flow rate of the sample out in the field.

## **4. EQUIPMENT AND SUPPLIES**

- Computer with Internet access and Lab Application
- Barcode scanner
- Thermal printer
- UPS label rolls and pouches
- Highlighters
- Stapler

## **5. PROCEDURE**

The Quality Check station is located to the left of the bin rack in the sample handling laboratory. Bins ready to be checked are located in the cabinet under the counter at this station. Before starting this station, please print out the UPS labels for the bin that is going to be checked.

### *5.1 Procedures for Regular UPS Shipping*

- 1) Some sites cannot receive boxes via UPS for various reasons (remoteness, delivery issues, etc.). The bins for those sites have white site code labels. UPS labels will not be generated for those bins unless authorized by a lab tech. All other bins will need UPS labels.
- 2) Go to <http://www.ups.com> on the computer at the QC Check station.
- 3) Click the Log-in option at the top of the web page.
  - a. The user ID is: aqglab
  - b. The password is: Aqg 1123 (there is a space between the g and the 1).
- 4) When the shipping information page loads, choose a site code from the "Address Book" pull-down menu located at the top middle of the page (ex., CAB11). The page will refresh with the address information for that site. If the site is one of the international destinations (BYIS1, VIIS1, BALA1, EGBE1), continue to the International Shipping Procedures in Section F.
- 5) Leave the "Ship From" and "Return" addresses as default. They should be the Crocker/Jungerman Hall address.
- 6) For the question, "What are you shipping?"
  - a. Number of Packages: Leave as default (1)
  - b. Packaging Type: Select appropriate box size (Regular / Main, X-Site, C-only)
  - c. Weight: 4 lbs for main blue boxes, 6 lbs. for X-Sites, and 3 lbs. for C-only boxes (used for ATLA1, DETR1, PITT1).
  - d. Package Dimensions:
    - i. Main boxes: 9"x10"x6"
    - ii. X-Site boxes: 13"x10"x7"
    - iii. Small boxes (ATLA1, DETR1, PITT1): 9"x8"x6"
- 7) For "How Would You Like to Ship?" Click the "Compare Time and Cost" link. Choose the cheapest service that will get the box two business days before installation (usually the Friday before the first week installation date for the box). Keep in mind any holidays or weather delays when choosing a shipping option. For any site name followed by an "\*" at the time of site selection, ground service will deliver at the same speed as 2-day air or faster. When in doubt, it is always safer to choose 2<sup>nd</sup> day air.
- 8) References: Fill in Reference #1 with the four letters of the site code (omit the # that follows the site code) and add the date of first install, which can be found on the week 1 bag sticker. Do not put any slashes, dashes, commas, etc. For example, SAPE1 with a start date of 11/03 would be SAPE1103. For Reference #2, enter user initials. Fill in Reference #2 with 3-letter initials.
- 9) For "How Would You Like to Pay?" make sure that the default option is selected: 5FX769- Crocker Nuclear Laboratory.
- 10) Leave "Would You Like to Schedule a Pickup?" blank then click the "Next" button.
- 11) The UPS label will then print from the thermal printer at the QC Check station. There will be a confirmation box when the web page refreshes. Scroll down the refreshed webpage and choose the "Create a Return Shipment" option.
- 12) The page should refresh and the site code should have already been chosen from the drop-down Address Book menu. Confirm that it is the correct site code. Leave the 2<sup>nd</sup> box as default—it should provide Crocker's address.
- 13) For box #3, "What are you returning?" leave the Packaging type as default. The proper

weight should already be filled in, along with the package dimensions. There will be a new field in the box that asks for a "Merchandise Description." Please type in "Air Filters."

- 14) For box #4, "How would you like to return?" leave the service and delivery method as default. For any site name followed by an "\*" at the time of site selection, ground service will deliver at the same speed as 2-day air or faster. Otherwise, the service should always be 2<sup>nd</sup> Day Air and the "Label Delivery Method" should be "Print Return Label." When in doubt, it is always safer to choose 2<sup>nd</sup> day air.
- 15) Box #5 should have fields already entered. Leave them as they are.
- 16) Box #6 should have "Bill Shipping Charges to 5FX769-Crocker Nuclear Laboratory." Make sure this is selected, and then click "Next."
- 17) Retrieve both labels from the thermal printer. Highlight and place the outgoing label in the bin. Put the return label aside as it will be used during the Final Check.
- 18) If the bin is not immediately going through the QC Check station, highlight the site code on the outgoing label and place both labels in the bin.

## *5.2 Outgoing International Shipments*

- 1) If BYIS1, VIIS1, EGBE1, or BALA1 is selected from the "Address Book" drop-down menu, the international shipment page will come up. It is very similar to the normal page but with a few unique boxes.
- 2) Leave "Ship From" and "Return" addresses as default.
- 3) Differences that all four sites will ask for:
  - a. Description of Goods: Type in "Air Filters."
  - b. Weight: 3 lbs. for Regular / Main sites, and 4 lbs for X-Sites.
  - c. BYIS1, EGBE1, and BALA1 will have an extra field at the top asking for Customs Value. Type in "100."
- 4) Select Service: Select UPS Worldwide Saver (Express).
- 5) Reference Section: Fill in as usual—four letters of site code and date of first install.
- 6) Bill shipping charges and bill duties and taxes: Make sure both of these are set to 5FX769— Crocker Nuclear Laboratory.
- 7) Make sure that the box saying "Review shipping details" is checked. Click "Next." Review shipping information and then click "Ship now."
- 8) A new page will come up with different form options available. Make sure to select "Complete Selected Export Forms Online"—it should be default checked. Also, make sure that Commercial Invoice is checked. This should also be set as default. At the bottom, make sure the box saying "Preview Shipment before completing shipment" is checked.
- 9) On the next page, click "Add Product." Add "Air Filters" from the Product List drop-down menu. The product description should automatically fill in. Type "1" for Number of units. Price per unit should be defaulted to 100.00 and the currency should be "USD US Dollars." For Unit of Measure, choose "Pieces." Then click "Submit," followed by "Next."
- 10) Leave everything as it is on the next page. Click "Next."
- 11) Leave the "Form Description" blank and click "Next."
- 12) On this page, choose "Print All Online Forms." Then click "Open" if the browser asks to



open or save the forms.

- 13) Go to "File" in Adobe and choose "Print." Make sure the Main Bay Printer is selected and press "Print." Three copies of the invoice should print out from the printer in the bay.
- 14) Retrieve the commercial invoices from the printer. Sign and date each one in the appropriate fields at the bottom of the page.
- 15) Go back to the UPS webpage and click "Next."
- 16) Leave everything as default in the Select Export Forms and click "Next."
- 17) Review all details (paying special attention to the payment information in Box 4) and choose "Ship Now." Two labels should print. One will look like a regular outgoing label and the other will have a paragraph printed on it and a section for a signature. Sign and date the label. Retrieve a UPS pouch by QC Check station and place the commercial invoices in it. Make sure that the barcode on the first commercial invoice is visible through the pouch.

### *5.3 International Return Shipping*

- 1) To create an International Return, choose "Create Import" from the list of options on the left-hand side of the screen.
- 2) Box 1: "Where is this shipment coming from?" Select site: BYIS1, EGBE1, VIIS1, or BALA1.
- 3) Leave Box #2 as default—it should be the Crocker address.
- 4) Box 3: What Are You Returning?
  - a. Description of Goods: "Used Air Filters for Testing"
  - b. Number of packages: Default should be 1
  - c. Weight: 3 lbs. for Regular / Main boxes and 4 lbs. for X-Sites
  - d. Merchandise description: Type in "Used Air Filters for Testing."
- 5) Box #4: "How Would You Like to Return?"
  - a. Service: Select UPS standard for Canadian sites, UPS Express Saver for VIIS1 and BYIS1.
  - b. Label Delivery Method: Select Print Return Label if possible, otherwise choose electronic label.
  - c. Make sure "Send E-mail notifications" is checked.
- 6) Box #5: "Would you like to add reference numbers to this return shipment?"
  - a. Reference #1: SITE MMDD (4 letter site code plus month and date of first Tuesday install).
  - b. Reference #2: Enter user initials.
- 7) Box #6: "How Would You Like to Pay?"
  - a. Bill shipping charges to: 5FX769-Crocker Nuclear Laboratory.
  - b. Bill duties and taxes to: 5FX769-Crocker Nuclear Laboratory.
  - c. Make sure "Review shipping details, including price, before completing the shipment" is checked.
- 8) Box #1 in "Enter Additional Import Control Information":
  - a. If "electronic label" was selected, make sure "Send Electronic Label to:" is filled in with a lab technician's email. (ex. kawamoto@crocker.ucdavis.edu)
- 9) Review your return details and press "Next."
- 10) Leave everything as default. "Complete selected export forms online" and

“Commercial invoice” should be checked. Press “Add product.”

11) “Enter Product Information”:

- a. Choose Air Filter Return from the Product List drop-down menu. The Product Description will automatically fill in.
- b. Make sure that the Product Country of Origin is set to the default, “United States- US.”
- c. Number of units: 1
- d. Price per unit: 100
- e. Unit of Measurement: Pieces

12) Press “Next.” Leave everything as default on the next page and click “Next” again.

13) Leave the “Forms Description” blank and press “Next.”

14) Review Export forms—leave everything default and do not print. The click “Next.”

15) Leave everything on this page as default.

16) Click “Ship now.” If “Electronic label” was selected, the lab tech whose email address was entered previously will get an email that asks him or her to retrieve the labels. The lab tech will print out the labels and commercial invoices. Otherwise print out all labels and documents as before. Put all of them into a UPS pouch after signing and dating all forms and place it in the bin. It will be shipped out in the blue box with the filters.

#### *5.4 Quality Check Procedure*

- 1) Highlight the site code present on the outgoing label and make sure to place it in the bin. Set the return label aside. Note that bins with white labels are USPS sites. Refer to the USPS SOP at the QC Check station to print these labels.
- 2) Open the Lab Application. Navigate to Pre-Sampling, and then QC Check, entering three-letter initials if necessary.
- 3) Scan the bin barcode (type in the 5-character site code if the bin is unlabeled).
- 4) Check the week bag labels to make sure that they match the dates on the screen, and have the correct installation dates on them.
- 5) Starting with Week 1, remove the log sheet and all of the cartridges. Starting with the “A” cartridge, make sure that the dates and sequence numbers written on the labels are correct and in the right order. Then remove all of the red caps on the cassette bottoms. Make sure that there is a filter in all of the sampling positions and “dummy” sets in the non-sampling positions. Also check for any specks, holes, etc. on the filter. Continue this process with the B, C, and D cartridges. If any specks are found, try gently tapping the cartridge on the counter. If the speck comes off and it is an “A” or “D” filter, have the person at “Pre-sample Weigh-in” reweigh it to make sure that the weight did not change. If it did change, cross out the weight of the filter on the log sheet and write in the new weight. Then give the log sheet to a lab tech so that they can make the change and note it in JIRA.
- 6) Make sure all “A,” “C,” and “D” cartridges have loose screens in each cassette. Do this by looking through the hole in the cassette tops. Also, check carefully for double screens. Double screens will normally create a “honeycomb” pattern when viewed from the top of the cassette. If in doubt about whether a screen is a single or a double, it is best to check to make sure.
- 7) Pay special attention to the “C” filters. They have a smooth side and a rough side. The

smooth side should be visible when the red cap is removed from the cassette bottom. Make sure all sides of the filter are completely inside the cup as well.

- 8) Now, look at the log sheet. This will be the only piece of paper in the bag and will be folded. The site and installation date are typed in the top center of the page. Make sure that the site on the log sheet corresponds to the site label on the bin and that the installation date matches the week bag's sticker and the date on the Lab Application. Highlight this information so that it draws the operator's attention. To the right of this information is the eight-digit flashcard number. This number corresponds to the flashcard that can be found in the Week 1 bag in its own small, labeled bag. Retrieve the flashcard and check to see that the number matches what is written on the log sheet. Make sure that the flashcard goes back into the Week 1 bag. There is only one flashcard per bin; sites that also have an X Mod will only have one flashcard, found in Week 1 of its main box.
- 9) The "A" and "D" filters are weighed before being installed and the weights are recorded at the bottom left hand corner of each log sheet. From top to bottom, the numbers on the left are for the weights of the "A" filters and the numbers on the right are the weights of the "D" filters.
- 10) Put the cartridges back in the bag, and then slide the log sheet and flashcard into the bag. Repeat this process for weeks 2 and 3. Make sure to highlight the site name and installation date for each log sheet.
- 11) For Week 3, staple the UPS return label (if applicable) to the front of the log sheet. Scan the UPS tracking number to the appropriate text box. If it is a USPS site, change the dropdown to USPS and scan the USPS tracking number. Replace the contents of the last week's bag. Check the boxes for "Screens," "Field blank (if applicable)" and "Flashcard Numbers", then hit "Submit". Place the bin into the rack; make sure the front of the bin faces the wall and not out into the room. This orientation signifies that the bin has been checked before being shipped out.
- 12) Occasionally, there will be an extra step at the Quality Check station. There will be notes or signs displayed next to the computer or on a specific bin with instructions. Some examples are putting a newsletter in the bin, changing an address label, or giving the bin to a lab technician before shipping out.

**TI 251K** Box Shipping

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## **1. PURPOSE AND APPLICABILITY**

The purpose of this SOP is to describe the procedures used to pack and ship boxes for IMPROVE network sites.

## **2. SUMMARY OF THE METHOD**

Boxes are packed and placed at designated locations for pickup.

## **3. CAUTIONS**

Many site names are similar. It is important to pay close attention to the site code of the bin and to ensure that the proper label is printed for it.

## **4. EQUIPMENT AND SUPPLIES**

- Computer with Lab Application
- Barcode scanner

## **5. PROCEDURE**

- 1) Open the Lab Application. Navigate to Pre-Sampling, and then Box Shipping, entering three-letter initials if necessary.
- 2) Scan the bin barcode (type in the 5-character site code if the bin is unlabeled).
- 3) Check the week bag labels to make sure that they match the dates on the screen, and have the correct installation dates on them.
- 4) Find the site-specific shipping box on the shelves to the right of the shipping station.
- 5) Remove any old labels (both larger shipping labels, smaller tracking tags, and old box-top label) and extra pieces of tape.
- 6) After confirming that all bags are sealed, move the bags from the bin into the shipping box, orienting them from Week1 to Week3 from left to right.
- 7) In one of the trays located at the Box Shipping station, find the corresponding box-top label. The site, and three installation dates should match the Lab Application information, as well as the bag labels site, date, and color. Place it on the upper left of the top face of the box.
- 8) Place the outbound shipping label on the top face of the box, scanning the tracking number into the appropriate text box. Remember to change the drop down to USPS if it is a USPS label.
- 9) Seal the shipping box with a small piece of packing tape, then press "submit" on the Lab Application.
- 10) UPS boxes are ideally packed before 4 p.m. to assure pickup that day. These are placed 10-15 feet in front of the High Bay doors.
- 11) USPS boxes are picked up on Monday, Wednesday, and Friday mornings. These are placed in the lobby under the receptionist's windows (as marked by the sign).

**TI 251L BC Filter Shipments**

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## **1. PURPOSE AND APPLICABILITY**

The purpose of this SOP is to describe the procedures used to check and ship nylon and quartz IMPROVE filters for analysis. These instructions apply to all routine “B” and “C” IMPROVE filters.

## **2. SUMMARY OF METHOD**

Final tray check lists are generated for “B” and “C” filters before they are prepared for shipping. Once a month, an additional 5 lab blanks are added to each nylon filter shipment. Nylon filters are sent to the ion contractor, which as of October 2015 is RTI, and the quartz filters are shipped to the carbon contractor, which as of October 2015 is DRI.

## **3. CAUTIONS**

Be careful when tray checking to make sure that every Petri dish has a filter in it. Pay particular attention to the Petri dishes that are loaded with lab blanks.

Be aware that working with files in the U:\ drive is extremely risky. Any errors that may occur can cause problems for lab equipment or analysis. Be extra careful when deleting or moving files.

Pay close attention when entering information into any macro. The information has to be in a designated format for the macro to work.

## **4. PERSONNEL QUALIFICATIONS**

Only trained lab technicians generate tray check lists and create Excel files for shipping.

## **5. EQUIPMENT AND SUPPLIES**

The following supplies are necessary for “B” and “C” shipments:

- 1ft. cubed cardboard boxes and packing material
- Re-sealable bags
- Packing tape
- Ice Packs (for “C” filters)
- ULINE Premium Laser Labels S-8039
- Envelopes

## **6. PROCEDURE**

### *6.1 Preparing Contractor Lists for “B” Filters*

#### 6.1.1 Acquiring First Filter for New Shipment

In the Nylon-filter refrigerator in Room 116, find the set number to be shipped by

identifying the lowest set number for that year. Open the B-Ions contractor's list for the previous shipment (the tray check list for the last shipment sent out). The file name is BContractors[#of set].xlsx and is located in U:\IMPROVE\_Lab\Lab\_Gravimetric\Applications and Macros. Go to the "Master" tab. The first filter from that list is the filter information that will be needed later. Write down the Year, site name, date, and status. Close this file and do not save any changes.

#### 6.1.2 Running the Macro

Open MACROS.xlsm, to access the macro, press "Alt+F8." Select the "Ion\_Contractors" macro and click "Run."

#### 6.1.3 Entering Macro Information

The macro will ask for enough information to identify the first filter for the list being created. Follow the instructions in the input boxes. Be careful to enter the information in the exact format as the example. Following are the parameters of the input boxes:

- 1) **Year.** Enter the desired year in number format. Example: 2015.
- 2) **Set.** Enter the desired set in number format. Example: 1.
- 3) **Site Name.** Enter the site code for the first filter. Example: ACAD1.
- 4) **Sample Date.** Enter the sample date from the first filter in "\*m/\*d/yyyy" format. Example: 1/1/2013.
- 5) **Status.** Enter the status of the first filter. Example: NM

#### 6.1.4 Printing the Pages

Print a copy of each B\_Sheet\_[#] tab. The file will automatically be saved. If there was a previous version of the current set, that file will be overwritten by the new one.

### *6.2 Monthly Ion Lab Blanks*

Near the end of every month, 5 clean lab blanks must be sent out. Add these lab blanks to an ion set being prepared for shipment.

#### 6.2.1 Generating Labels

Open the "Lab BLNK stickers" file located in U:\IMPROVE\_Lab\Lab\_Gravimetric\Applications and Macros\Ion. Enter the date that the filters are being shipped into the yellow box in the upper left corner. This should update the cassette stickers near the middle of the page. On the bottom left of the page, update the ship date to record when each month's lab blanks were shipped. Print out the cassette stickers to label 5 clean Petri dishes. Load one clean B filter (no paper dummies) into each of the 5 Petri dishes.

#### 6.2.2 Appending the Tray Check List



Go back to the tray check list for the ion set being shipped. Go to “B\_Sheet\_8.” Copy the last 5 entries and append them to the beginning of the “Master List,” which is the following tab. Replace the last 5 entries of “B\_Sheet\_8” with the information from the lab blank stickers. These 5 entries should all be identical, with BLNK1 for the site, and shipment day as the filter date. Change the status to “LB” and leave the analysis as “Ion.”

Replace the last 5 network filters in Tray 8 with the 5 lab blanks, so that the tray check list matches the filters in the tray.

### 6.2.3 Tray Checking

Confirm that each tray check list matches the inventory of filters in each tray. Print one copy of each sheet in the tray check list. Start with Tray 1. Open the first tray, with the filters on the right and the empty lid on the left. Note the site and sample date of the first filter on the tray check list. Select the first filter in the upper left, position 1. Confirm a filter is present in the correct sample-side-up orientation, and that the filter information noted matches the tray check list. If a filter is present and the information matches, place a check before the filter IDX. Perform the same checks for each filter on the tray check list/filter tray, correcting any discrepancies as necessary. Continue on to each subsequent tray until the set is done.

## *6.3 Preparing Contractor Lists for “C” Filters*

### 6.3.1 Acquiring the Last Filter of Last Shipment

In the Quartz-freezer in Room 116, find the set number to be shipped by identifying the lowest set number for that year. Open the C-Carbon contractor’s list for the last shipment (the tray check list for the last shipment sent out). The file name is CContractors[#offset].xlsx and is located in U:\IMPROVE\_Lab\Lab\_Gravimetric\Applications and Macros\Carbon. Go to the “Master” tab. The first filter from that list is the filter information that will be needed later. Write down the Year, site name, date, and status (CP or FB). Close this file and do not save any changes.

### 6.3.2 Running the Macro

Open MACROS.xlsm. To access the macro, press “Alt+F8.” Select the “Carbon\_Contractors” macro and click “Run.”

### 6.3.3 Entering Macro Information

The macro will ask for enough information to identify the last filter of the shipment. Follow the instructions in the input boxes. Be careful to enter the information in the exact format as the example. Following is the list of the parameters it will ask along with screenshots of the prompts:

- 1) **Year.** Enter the desired year in number format. Example: 2015.
- 2) **Set.** Enter the desired set in number format. Example: 1.
- 3) **Site Name.** Enter the site code for the first filter. Example: ACAD1.
- 4) **Sample Date.** Enter the sample date from the first filter in “\*m/\*d/yyyy” format. Example: 1/1/2013.
- 5) **Status.** Enter the status of the filter (CP or FB). Example: CP

#### 6.3.4 Printing the Pages

Print a copy of each C-Sheet\_[#] tab and the new file will be automatically saved. Any previous version of the set's tray sheets will be overwritten with the new one. Close the file and collect the new tray checking lists from the printer.

#### 6.3.5 Tray Checking

See Section 6.3 for instructions on tray checking.

### *6.4 Shipping Instructions for B-Ion or C-Carbon*

#### 6.4.1 Generating Excel Files

Open the appropriate Contractors file for the current shipment. Also open MACROS.xlsm, located in U:\IMPROVE\_Lab\Lab\_Gravimetric\Applications and Macros. With the contractor files open and the first worksheet selected,, access the macro by pressing “Alt+F8.” Select the respective “MACROS!Master\_List\_B” or “MACROS!Master\_List\_C” macro and click on “Run.” The macro will display a prompt for the correct year and set number.

Please click “OK” to confirm options. The generated Excel file will be located in U:\IMPROVE\_Lab\Lab\_Gravimetric\Applications and Macros\Shipments\CARBON or U:\IMPROVE\_Lab\Lab\_Gravimetric\Applications and Macros\Shipments\ION. File it under the correct shipment year. Using the entries from the first worksheet, update the Master List for that quarter. The Master List records information for all shipped filters, their ship date, set, and tray number, and is located in U:\IMPROVE\_Lab\Lab\_Gravimetric\Applications and Macros\Shipments\Masterlists

#### 6.4.2 Creating a Cover Letter

Open “RTI & DRI Cover Letter.xls” file which is located U:\IMPROVE\_Lab\Lab\_Gravimetric\Applications and Macros. In the “SiteFetching” tab, confirm that the corresponding ion or carbon table information is correct. The data table with columns “SITE,” “DATE,” and Rows 1-8 for each tray should show the SITE name and sample date for the first filter in each tray check sheet. All of this data will be pulled from “B Contractors” file under the “IONS” folder, or “C Contractors” file in the “Carbon” folder. Confirm Ship Date and Ship Name. These two files reflect the most recent tray check list for which shipment files were generated. If anything is incorrect,

make the appropriate changes. If there are any network link updates, the links may need to be updated. Any changes will automatically update relevant fields for the entire workbook.

For the B-ion cover letter, go to the "B Cover Letter" tab, and for C-carbon go to the "C Cover Letter" tab. The table in the upper left should reflect the same information as the "Site fetching" tab's table checked previously. Make sure that the Year is current. 400 represents the "Total # of Filters" included the shipment, and 8 represents the "Total # of trays. Make any relevant and necessary changes.

#### 6.4.3 Generating Tray Labels

Go to the "Generate Tray Labels" tab and fill out the appropriate information in the upper left corner. Please note the warnings. Make sure that there is only one "Y" filled out for either "B" or "C" labels, or the sheet will error. The other entry should be "N." Print the tray labels, and apply them to the shipment's trays. The labels are generated Tray 1-7 on the left column, from top to bottom, with Tray 8 on the right column. Print the correct labels onto ULINE Premium Laser Labels S-8039. Apply the labels to the tops of the correct tray, on the left side over the "Pall Corporation" imprint, "facing" the right.

### *6.5 Preparing the Shipment*

#### 6.5.1 Printing the Hard Copy and File Copy

Prepare two sets of tray check lists with the attached cover letter. Print two copies of the appropriate cover letter and another clean copy of the previously-generated tray check list. For each, staple the cover letter to the top of the tray check lists (stacked with Tray 1 at the top). Set one copy aside as the file copy, and fold the other copy into thirds as the hard copy. The hard copy will go into an envelope and will accompany the shipment. The file copy can be stored in the labeled drawer in Room 116.

#### 6.5.2 Boxing the Trays

Place all filter trays into a 1 ft. cube cardboard box, stacked Tray 1-4 from top to bottom on the left, Tray 5-8 from top to bottom on the right (if there are more than four trays). Include the enveloped hard copy in a watertight re-sealable bag, and use bubble wrap to secure the trays. Quartz shipments must include an ice pack, covered in bubble wrap to prevent the cardboard from getting moist. Ice packs are located in the Quartz-freezer in Room 116. Securely seal the cardboard box with packing tape.

#### 6.5.3 Printing Shipping Labels

Go to the UPS website and log into CampusShip. The username is: AqgLab and the password is: Aqg 1123. Make sure to include a space between the "g" and the "1."

Ion shipments will go to Research Triangle Institute (RTI in the UPS address book).

Packaging: Other Packaging

Weight: 12 lbs.

Dimensions: 12 in. x 12 in. x 12 in.  
Service: UPS 2<sup>nd</sup> Day Air  
Declared Value: \$5000 (This package has “high value” requiring UPS to provide special handling)  
Reference #1: [Year]SET[#]BIONS  
Reference #2: [user initials]

Carbon shipments will go to Desert Research Institute (DRI in the UPS address book).  
Packaging: Other Packaging  
Weight: 12 lbs.  
Dimensions: 12 in. x 12 in. x 12 in.  
Service: UPS Ground (this should arrive at the same time as the Next-Day Air service)  
Declared Value: \$5000 (this package has “high value” requiring UPS to provide special handling)  
Reference #1: [Year]SET[#]CCARBON  
Reference #2: [user initials]

When the shipping label is printed, two copies of the shipping receipt must be printed as well (sending one print job onto letter-sized paper should print two identical copies).

Apply the shipping label to the outside of the box. One copy of the shipping receipt must be given to the UPS pickup driver. The other copy must be signed and dated by the same driver and stapled to the back of the file copy of the cover letter and tray check lists for record-keeping.

#### 6.6 E-mailing

For carbon shipments, open the “DRI email” tab in the “RTI & DRI cover letter” file, and for ion shipments, open the “RTI email” tab. Ion shipments will be addressed to Eva Hardison [Eva@RTI.org](mailto:Eva@RTI.org) and all carbon shipments will be addressed to [eaftcarbon@dri.edu](mailto:eaftcarbon@dri.edu). Make sure Michelle Connor ([MConner@RTI.org](mailto:MConner@RTI.org)) is copied in all Ion shipments.

Copy and paste (values only) the e-mail template to a new e-mail sheet. The “To” and “Subject line” guidelines can be found above the template.

Confirm that the Year, Set number, and Ship Date in the subject line, as well as in the e-mail template body, are correct. At the bottom, confirm each tray’s first filter site and date. Attach the correct previously-generated .xls file.

**TI 251M** A Tray Checking

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## **1. PURPOSE AND APPLICABILITY**

The purpose of this SOP is to describe the procedure for preparing “A” filters for FTIR. This procedure is applicable to “A” filters that sampled from January 2011 and on.

## **2. SUMMARY OF METHOD**

After “A” filters have been post-weighed, they are placed in Petri dishes and labeled with a sticker designating the site name and sample date of the filters. Then, they are put into labeled Petri trays. When the trays are full, they are placed on a lab technician’s desk. Weekly checks are performed as outlined in JIRA issue LO-25. A lab technician then runs the macro for the appropriate filter type and generates a tray check list.

Filters are checked and arranged to match the order of the list. Trays are labeled with stickers to indicate set and tray number, and a hard copy of the tray list is printed and stored in the tray. “A” trays are stored in labeled boxes, which are placed in Room 116L.

## **3. CAUTIONS**

Pay close attention when entering information into any macro. The information has to be in the exact format as the example shown in the input box. If an incorrect format is entered, the macro will not work correctly and an error will occur. If an error does occur, close the files and start over.

Be sure to enter the correct set number and the correct first filter information when generating tray check lists. A mistake in entering either one of these can cause significant confusion later on in processing.

## **4. PERSONNEL QUALIFICATIONS**

Only trained laboratory technicians generate tray check lists for the “A” filters. Student laboratory assistants may perform the tray check process after training.

## **5. PROCEDURE**

Weekly Checks, outlined in JIRA issue LO-25, must be performed before checking A filter trays.

### **5.1 Review Logs Statuses, Comments, and Flags**

- 1) Open MACROS.xlsm located in U:\IMPROVE\_Lab\Lab\_Gravimetric\Applications and Macros.
- 2) To access the macros menu, press “ALT-F8.” Select the “FTIR\_Contractors” macro for “A” filters. Click “Run” after selecting the appropriate macro.
- 3) Follow the prompts and enter the start date (three weeks before the earliest date of the filters received that week).
- 4) On the “Condensed View” tab, any Logs entry with a comment, a non-NM status, or a non “F” flag will appear. For each line, review the comments and statuses for

accuracy.

- 5) Update any errors as described in the Status Changes section.

## 5.2 Review Weights

- 1) Access the Weights Data Validation Report located here <http://cl-sql/Reports/Pages/Folder.aspx?ItemPath=%2fIMPROVE+Reports%2fFilter+Processing&ViewMode=List>
- 2) With all sites selected, choose the Start Date three weeks before the earliest date of the filters received that week, and the current date as the End Date.
- 3) Export the report as an Excel file.
- 4) Delete the first blank row, highlight columns A through P and filter the results.
- 5) Filter Status Weights and Status Logs to show only NM and QD.
- 6) Filter the Difference column to weights greater than 2 and less than 30. Review high mass differences and apply comments to Logs (through the WebApp) as necessary.
- 7) Resort the Difference column to weights less than 0.005 and greater than -30. Review low mass differences and apply comments to Logs (through the WebApp) as necessary.
- 8) Resort Status Weights to FB statuses. Review FB mass differences and apply comments to Logs (through the WebApp) as necessary.

## 5.3 Track USPS boxes sent out that week.

## 5.4 Through reporting services, review the Late Boxes and Outgoing Boxes reports.

## 5.5 Run the Recent Problem macro in the MACROS .xlsm file located in

U:\IMPROVE\_Lab\Lab\_Gravimetric\Applications and Macros. When prompted, set the start date as the first of the year and end date as the current date. Any site that has lost more than ten samples for the year is added to the Problem Sites tab of the file located here U:\IMPROVE\_Lab\Lab\_Gravimetric\Weekly Updates\Miscellaneous.xlsx. Those sites must also be contacted (emailed) with a summary of their site's progress. Update previous entries as necessary. In JIRA, update the Site Info Page for each site as well.

## 5.6 Acquiring First Filter for Updating Contractor Lists

- 1) Take note of which year and set need to be updated.
- 2) All Contractor lists are stored in U:\IMPROVE\_Lab\Lab\_Gravimetric\Applications and Macros. Open the contractor list file for the set previous to the one that needs to be updated. For "A" filters with completed sets, go into the "XRF" folder. Then, click on the "Closed" folder with the correct sampling year (file name "[YYYY] Closed". So, for example, if set 6 of 2015 for "A" filters needs to be updated, go to the 2015 Closed folder, which can be found by clicking on "XRF," and open the " 2015 LAB XRF Set 6 Tray # (where # is the highest tray number)" Excel sheet.
- 3) Once the file is open, go to the last incomplete tray or the "Master" tab. The

first filter in this list contains the filter information needed to update the next set.

- 4) Write down the tray, site name, date, and status of the first filter. Close this file and do not save any changes.

#### *5.7 Running the Macros*

Located U:\IMPROVE\_Lab\Lab\_Gravimetric\Applications and Macros, open MACROS.xls. To access the macros menu, press "ALT-F8." Select the "FTIR\_Contractors" macro for "A" filters. Click "Run" after selecting the appropriate macro.

#### *5.8 Entering the Macro Information*

The macro will ask a series of questions to generate the appropriate tray check list. Follow the instructions in the input boxes. Be careful to enter the information in the exact format as the example. Following is a list and screenshots of the parameters that both macros will ask.

- 1) **Year.** Enter the desired year in number format. Example: 2015
- 2) **Set.** Enter the desired set in number format. Example: 1.
- 3) **Tray.** Enter the desired tray in number format. Example: 1.
- 4) **Site Name.** Enter the site code for the first filter.
- 5) **Sample Date.** Enter the sample date from the first filter in "\*m/\*d/yyyy" format. Example: 1/1/2013.
- 6) **Status.** Enter the status of the first filter. Example: QD.

#### *5.9 Printing the Pages*

Select all completed "A\_Sheet\_[#]" tabs. Go to the File tab and choose "Print." Make sure the selected printer is Main Bay Copier. Print the page(s). The type of filter and the set and tray number should already be printed at the top of the page(s).

#### *5.10 Tray Checking*

After the lists have been printed, confirm that the contents of each tray match its corresponding list. Check that the site name and sample date is correct for each position in the tray. Initial and date the list and then fold it up and place it in the corresponding tray after the check is complete. Place the trays in the designated location in Room 116.

#### *5.11 Managing Contractor Files*

When a set of "A" filters is complete, go to the "U:\IMPROVE\_Lab\Lab\_Gravimetric\Applications and Macros\XRF" directory. Copy the corresponding Excel file for the set to the correct closed year folder (named "[YYYY] Closed"). If this folder does not exist, create it. Moving files into these folders eliminates the risk of them being overwritten. Reopen the original file and remove the Filter List, Master, or incomplete "A\_Sheet\_#" sheets if they are present. Save these changes as a new file,



removing the “ Tray #” from the file name, in the same location.

**TI 251N** Cleaning Loose Screens

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## **1. PURPOSE AND APPLICABILITY**

The purpose of this SOP is to describe the equipment, supplies, and details needed to clean 25mm loose screens.

## **2. SUMMARY OF METHOD**

25mm loose screens are cleaned using ethanol to remove any residue that may have accumulated during sampling. Loose screens used for quartz ("C") filters are kept separate from those used for Teflon® ("A" and "D") filters to avoid any cross contamination.

## **3. CAUTIONS**

Make sure to use the appropriate forceps, cleaning jars, and containers for the screens being cleaned. Because the "C" screens are separated from the "A" and "D" screens, there are two sets of equipment to use so that no cross contamination can occur.

## **4. PERSONNEL QUALIFICATIONS**

Only trained laboratory technicians may clean the loose screens. The Laboratory Safety course offered by EH&S is strongly advised and may become a requirement that must be completed before technicians can perform this procedure.

## **5. SAFETY**

Ethyl alcohol can be absorbed through the skin and is irritating to the eyes. Nitrile gloves, lab coat, and safety glasses should be worn while performing this task. To reduce the dispersion of fumes, this procedure is completed in a fume hood located in the chemistry laboratory on the first floor of Jungerman Hall.

## **6. EQUIPMENT AND SUPPLIES**

- Nitrile gloves
- Safety glasses and lab coat
- Fume hood
- 2 Glass Jars with cover (1 for C screens, 1 for A+D screens)
- Drying rack with spill tray
- 2 forceps (1 for C screens, 1 for A+D screens)
- Ethanol (at least 97%)
- EH&S plastic container for ethanol waste
- 2 containers for cleaned screens (1 for Cs, 1 for A+D screens)

## **7. PROCEDURE**

- 1) Put on gloves, lab coat, and safety glasses before beginning the procedure. Bring the used loose screens from the sample handling laboratory into the chemistry laboratory down the hall.
- 2) Pour the used screens into the appropriate glass jar; if cleaning quartz screens, use the designated quartz jar. If cleaning screens used with Teflon® filters, use the designated "A" and "D" jar. Fill the jar about  $\frac{3}{4}$  full with screens.
- 3) Fill the glass jar with ethanol to approximately 1" above the level of the screens.
- 4) Cover the jar and swirl it in a clockwise manner for approximately one minute.
- 5) Dispose of used ethanol into the approved container marked for waste.
- 6) Prepare the drying rack and clean it with ethanol and kimwipes.
- 7) Pour out screens onto the drying rack, spacing them apart with gloves or the designated forceps appropriate for the screen type.
- 8) Leave the screens on the rack until they are dry.
- 9) Transfer the screens into the designated container for clean screens and then seal it. Bring the clean screens back into the sample handling laboratory.
- 10) Waste disposal: Once the waste level has been reached, contact EH&S for pickup by filling out an online request  
at: <http://safetyapps.ucdavis.edu/EHS/wasterequest/index.cfm>

## 8. ADDITIONAL RESOURCES

For more information on waste disposal, visit the EH&S Hazardous Waste Management website. <http://safetyservices.ucdavis.edu/ps/hmhwm>

**TI 251P: General Laboratory Procedures**

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## **1. PURPOSE AND APPLICABILITY**

The purpose of this SOP is to detail procedures used often in the sample handling lab that lab technicians must perform but do not fit in a specific category. They are general tasks that are performed on a regular basis to keep operations running smoothly in the lab.

## **2. SUMMARY OF METHOD**

Many small tasks must be performed on a regular basis to ensure lab operations run smoothly.

These include making new and replacement flashcards, destroying old ones, creating all types of stickers, creating purchase orders, “validating” and replacing weights, entering status adjustments, handling bad field blanks, and closing the quarter after all samples have been collected.

## **3. CAUTIONS**

When making changes to weights in the Web Application, pay very close attention to make sure the weight is entered correctly and in the appropriate cell.

When making new flashcards, be sure to choose numbers that have not been used before, especially when making replacement cards.

## **4. EQUIPMENT AND SUPPLIES**

Due to the number of different tasks described in this SOP, supplies are described in each individual procedure.

## **5. PROCEDURE**

### *5.1 Creating New Flashcards and Destroying Old Ones*

Each IMPROVE site has designated flashcards that are only used for that site. The number of designated cards per site depends on the box cycle rotation for that site. Sites that have 2 blue boxes also have 2 designated flashcards, and 3-box cycle sites (mostly mail sites) have three designated flashcards. Sometimes a card is lost or damaged and a new card must be assigned. Other flashcards, called replacement cards, are sent out to sites when the designated cards are late returning to the lab. Flashcards that no longer function properly are noted and discarded.

#### 5.1.1 Site Flashcards

When making a new flashcard, identify the next flashcard ID number to use. The simplest way to do this is to access the Web Application, find the appropriate site name, and press “Update.” Scroll to the left to the column called “FLSHCODE.” Check to see what other flashcard numbers are in use for that site (excluding the one that is being retired). This will provide a better picture of which flashcards have been used.

Some ID numbers will end in “00” and some will end in “01.” IDs that end in “00” are used

for Kodak® cards and those that end in “01” are used for Transcend® cards. Kodak® cards are no longer being introduced; only IDs ending in “01” should be used for new cards.

The first four digits of the flashcard ID will always remain the same, as that is the site’s UC CODE. The 6<sup>th</sup> number is typically the one that changes. For example, if the flashcards in use are [UC CODE].04.01 and [UC CODE].05.01 and the -04.01 card needs to be retired, the next card should have an ID of [UC CODE].06.01. If the 6<sup>th</sup> number will exceed 9, change the 5<sup>th</sup> number to 1 and the 6<sup>th</sup> number back to “0.”

Once a new ID number has been decided upon, create two new labels for the front and back of the flashcard, using another IMPROVE network card for reference.

Retrieve a new Transcend® flashcard. Apply the site sticker to the side of the card that says “Transcend” and “128 MB.” Apply the other sticker to the reverse side of the card.

#### 5.1.2 Replacement Flashcards

Replacement cards do not have a designated pattern to their ID numbers, but they should not be identical to any other replacement card ID. The easiest way to determine if a flashcard ID is already in use is to sort the flashcard ID column in the “Replacement FLASHCARDS” tab of the “Replacement Flashcard Log” (U:\IMPROVE\FishTXT\ReplacementFlashcard Log.xlsx).

#### 5.1.3 Destroying a Flashcard

Flashcards that will not be used in the field anymore due to malfunction or damage are destroyed.

### *5.2 Purchase Orders*

Purchase orders for the sample handling lab are typically created by one designated lab technician. The current purchase order template is emailed to staff periodically. At least once a year, administrative staff sends a new template to keep CNL account numbers and other important information updated.

Fill in the information that has blank boxes. For the “To” box, put in the company name and information. If contact with a representative has been made, put their name and contact information in this box. The “Ship to” box should include information for the person making the purchase order. The invoice box should be filled in with the information for the administrative staff member in charge of invoices.

Leave the next few boxes as default. Name and phone number of the person creating the purchase order should be filled in the technical contact box.

The “Tax” column should always have “Y” entered. Fill in the item number and quantity. Also fill in the unit (this information can typically be found on the vendor website. Fill in the description box—this can usually be copied and pasted from the vendor website as well.

Finally, fill in the catalogue number and unit price. The total price will be calculated automatically. Print the form and have either the principal investigator or laboratory manager sign it. Then, turn it in to administrative staff at the front desk and email the CO-op admin with an electronic copy.

### *5.3 Replacement Boxes*

Sometimes a box does not arrive in the lab in time to be processed and prepared for another cycle. When this happens, a replacement box is sent out.

To prepare a replacement box, start by pulling one of the replacement bins from the bottom of the bin rack in the sample handling lab. Replacement bins are not labeled and have 3 weeks' worth of cartridges. Make sure the orientation is correct for the box cycle. Write the name of the site on a sticky note and place it on the front of the bin. Collect the cassette and week bag stickers for the site from the file cabinet by the POST station and place them in the bin. Place the bin at the Cartridge Preparation station.

Write the name of the site on a post-it and place it on the flashcard. Take the flashcard to the flashcard box at the Cartridge Preparation station.

### *5.4 Replacing Weights*

Sometimes during the Quality Control check, a filter is found with a hole in it or particles that will not come off. When things like this happen, the student assistant changes out the filter for a new one and notes the new weight. The log sheet with the new weight is given to a lab technician, as the new weight needs to be entered into the AnalysisWeights table.

Create a new JIRA issue template. Update the Project to match the site. The Issue type should be a Sample Related Problem. The Priority can be changed to Minor.

Next open the Sample Comments document and find the "PreWeight adjustment" comment. Make pertinent changes to the comment (first relevant sample date, problem with the filter, channel, sample date, old and new weight, balance filter was weighed). If more than one filter is being adjusted, change the number in the upper left corner in the parentheses to match the number of filters being modified. Make sure each filter has its own row. Copy the first line to the JIRA issue's Summary line, and the rest to the Description field. Create the issue.

Make the appropriate weight adjustments through the Web Application and add a comment in the Logs record. Navigate back to the JIRA issue created previously and close it after confirming the weight change. The weight adjustment is now complete.

### *5.5 Monitoring Field Blanks*

Field blank quotas are monitored at the Cartridge Preparation station in the Lab Application. Even if too many field blanks are loaded, they are not removed. Manual modifications must be made to remove it from any analysis inventory list. It must also be manually added to the next terminal-status "Problems" inventory list. If a field blank is listed in the database, but is not physically loaded, an appropriate comment must be attached.

### *5.6 Status Adjustments*

Status adjustments are performed whenever the status of a filter changes after its



information has been entered into SQL. This is done by changing the status in Logs and adding a comment to explain the status was changed. A comment detailing the change is also added to the JIRA project in case any mistake is made making changes in Logs.

There are two important points to remember when making status adjustments:

- 1) When a change in LOGS is made using the Web Application, be very careful to make changes to the correct site, date, and channel.
- 2) It is important to follow a standardized way of commenting in LOGS and creating a JIRA issue so searches for information can be done efficiently. Use templates whenever possible.

The following steps describe how to change the status in LOGS:

- 1) Open the file named "2015 Comment Database.xls." It is located in U:\IMPROVE\_Lab\Lab\_Gravimetric.
- 2) Log in to <https://improve.atlassian.net/> Create a new JIRA issue template. Update the Project to match the site. The Issue type should be a Sample Related Problem. The Priority can be changed to Minor
- 3) Next open the Sample Comments document and find the "Status Adjustment" comment. Make pertinent changes to the comment using examples from the "2015 Comment Database". Update the first relevant sample date, problem with the filter, channel, sample date, and old and new status. If more than one filter is being adjusted, change the number in the upper left corner in the parentheses to match the number of filters being modified. Copy the first line to the JIRA issue's Summary line, and the rest to the Description field. Create the issue.
- 4) Log in to the Web Application:  
<http://webapp.improve.crocker.ucdavis.edu/LegacyLogs>
- 5) Navigate to the site and date for the filter. Go to the blue (i) icon for the "Edit record meta-data" link.
- 6) Update the appropriate status and insert the comment into the Comments field.
- 7) Click on save to finalize changes.
- 8) Navigate back to the JIRA issue created previously and close it after confirming the status change.
- 9) If a status is restored from terminal to non-terminal, the status in weights must also be updated through SWAP. Remotely connect to the old server and open SWAP (U:\IMPROVE\PROGRAMS\SWAP[current version].app. Select the site and quarter for the filter and press the "Weights" button. Scroll down to the appropriate sample date and module. Carefully change the status. Make sure to type the new status correctly and in the appropriate cell. Make sure to "Tab" or click out of the cell so that the new weight will save, then press "Esc."

## 5.7 Printing the Stickers

### 5.7.1 Cassette Stickers

Open the "Labels" link in U:\IMPROVE\_Lab\Lab\_Gravimetric. For cassette stickers, choose the correct cassette label file depending on cycle (2-3-2' or 3-2'-2). Press "Enable Content" if needed. Open up the correct tab (ABCD for normal sites, or X-Site). Type in the site name(s) that need stickers. Enter the position number for the quarter and sample date for the first filter. Make sure the number of samples in the quarter is correct (30 or 31).

Check the stickers to make sure everything looks OK. Then, click on "File" and press "Print." In the "Print" menu, make sure the IMPROVE lab printer is selected. The file will automatically attempt to print ten sheets, so modify the number of pages printed so only the active sheets will print. Click Printer Properties and change the source to "Manual Feed" in Tray 1. Press "Print" and feed the printer blank cassette sticker sheets. After printing, color the sticker sheets by drawing a line down the middle of the "A" column with a red Sharpie, down the middle of the "B" column with a yellow Sharpie, "C" column with a green Sharpie (both columns for double-Cs), and "D" column with a blue Sharpie.

For X mods, print the main site stickers first. Then, fill in the cassette sticker information for the X-mod using the correct tab. Then, when printing the stickers, feed the sheet with the main stickers printed on it into the printer. Put the sheet in sticker side up with the top of the sheet facing the printer. The X-mod information will be printed in the middle blank rows of the sheet.

File the colored stickers away into their respective folders in the file cabinet by the Post-Sample Weigh In station.

#### 5.7.2 Week Bag Labels

Open the "Labels" link in U:\IMPROVE\_Lab\Lab\_Gravimetric. To print labels that go on the week bags, choose the "Bag - Labels" Excel file that corresponds to the correct cycle for the box in question (2-3-2' or 3-2'-2). If more than one site needs week stickers, use the "Batch Site" tab. Enter in the sites and the first install date. Note that if one of the sites is BALA1 or WHPE1, this will require using the "Single Site" tab, as these sites have a Thursday installation date. If only one site needs printing, also use the "Single Site" printing. Use yellow stickers for 2-3-2' boxes and green stickers for 3-2'-2. The stickers are 2-5/8 in. X 1 in. Print following the same steps as the cassette stickers in section 5.8.1.

#### 5.7.3 Box Top Stickers

Open the "Labels" link in U:\IMPROVE\_Lab\Lab\_Gravimetric. For the box stickers that go on the top left of the box, choose the "Box – Top Labels" file that is correct for the box cycle (2-3-2' or 3-2'-2). For labels for multiple sites, use the "Batch site" tab. If printing labels for only one site or for a Thursday install site, use the "Single Site" tab. Print following the same steps as the cassette stickers in section 5.8.1. Use the same labels as the Week Bag labels. Use yellow stickers for 2-3-2' boxes and green ones for 3-2'-2 boxes.

#### 5.7.4 Box Stickers

Open the "Labels" link in U:\IMPROVE\_Lab\Lab\_Gravimetric. For the large stickers that are placed on the sides of the blue boxes, choose either "Box - Side Stickers 2-3-2'" or "Box

- Side Stickers 3-2'-2" depending on the cycle. Find the page containing the needed site stickers, or create a new site label at the bottom of the document (editing Site and UC Code as necessary). Print the page, making sure to use manual feed. In general, use yellow 4 in. X 2 in. yellow labels for 2-3-2' boxes and green 4 in. X 2 in. labels for 3-2'-2 boxes. If the labels being replaced on a box are pink for multi-box sites, make sure to print on pink stickers.

#### 5.7.5 D-filter Slide Stickers

To create slide stickers for a quarter, go U:\IMPROVE\_Lab\Lab\_Gravimetric\Applications and Macros\MACROS.xlsm. Once the Excel file is open, review the active worksheet. Update column "B" with any new sites. A and D X-sites can be inserted at the bottom. Edit column "C" to print D stickers. Edit column "E" to print stickers for that site "Y" for yes, "N" for no. Press ALT+F8 for the macro menu. Choose "Stickers." A warning may appear that the procedure will take seven minutes; note that the macro takes about a minute or two to work. Enter the first sample date for the quarter. Then, the macro will ask if the quarter has 31 samples. Choose the appropriate response depending on the quarter. Some tabs will appear. "1-20" has slide stickers for the first 20 samples for both "A" and "D." The "21-30" tab has the 21<sup>st</sup>-30<sup>th</sup> sample dates for both modules. If there are 31 samples in the quarter, there will be an additional tab for the 31<sup>st</sup> sample stickers. Print them using slide stickers, which are stored in the file cabinet in the Chemistry Laboratory on the Mezzanine floor. After they are printed, have student lab assistants separate the slide stickers according to site by using the paper cutter or scissors. For the 3<sup>rd</sup> position stickers, just separate the stickers after every 2<sup>nd</sup> cell across the row. For "D" slides, draw a line with a blue highlighter. Staple "1-20" and "21-30" stickers for each site together. The "31" slides will be stickered separately and added to slide trays later.

#### 5.7.6 D-filter Slide Box Stickers

Open the "Labels" link in U:\IMPROVE\_Lab\Lab\_Gravimetric. For slide box stickers, choose "Slide Box - Front D and FB-D." Press "Enable Content" if necessary. Enter in the slide quarter and the channel. Print the stickers, making sure to use the "manual feed" option for the printer. The stickers are white 4" X 1" stickers. Make sure to put the sticker sheets in sticker-side up. Print out Field Blank stickers as well. These are not automatically generated and will need to be added to the electronic document manually before printing.

After the stickers are printed, they will need a small sticker added to them between the quarter and channel. These small circular stickers can be found in the file cabinet by the PRE station. "D" slide boxes should have small blue stickers. The slide box stickers are then ready to be applied to the slide trays.

#### 5.7.7 Bin Labels

Open the "Labels" link in U:\IMPROVE\_Lab\Lab\_Gravimetric. Find the "Bin – Front" file. Click on the "Batch Site" tab and enter the site names for sites that need labels. Print using manual feed. Use the appropriate color sticker as designated in the box to the right in the file. To print barcode labels, log into the old server and navigate to the same

U:\IMPROVE\_Lab\Lab\_Gravimetric folder and print labels with the “Bin – Barcode” file.

#### *5.8 Adding New Sites*

The sample handling laboratory has several responsibilities when a new site is created. After lab personnel have been informed of the new site code, associated UCID, and cycle, blue boxes and a bin are assigned to the site. In order to be able to prepare the first box for the site, lab personnel must notify a database manager to set up the site in SQL. Next the first filter and sampling information must be entered into the Lab Application’s Cartridge Preparation station.

## TI 251Q Box Cycles and Cartridge Orientation

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## **1. PURPOSE AND APPLICABILITY**

The purpose of this SOP is to describe the different box cycles used for IMPROVE sites, proper cartridge orientation and configuration, and to explain the quarter naming system used to organize filters for analysis.

## **2. SUMMARY OF THE METHOD**

IMPROVE sites run on one of two box cycles, which are referred to as 2-3-2' (Yellow Bin) and 3-2'-2 (Blue Bin). Cycles are differentiated by cartridge configuration, bin color, and box labels. Each cycle is three weeks long, with loaded cartridges for each week. Cartridges are configured according to the week and cycle to which they belong. After the filters have been sampled and returned to the sample handling laboratory, they are organized for analysis and separated into four different quarters based on the months in which they were sampled.

## **3. PROCEDURE**

### *3.1 Types of Bins*

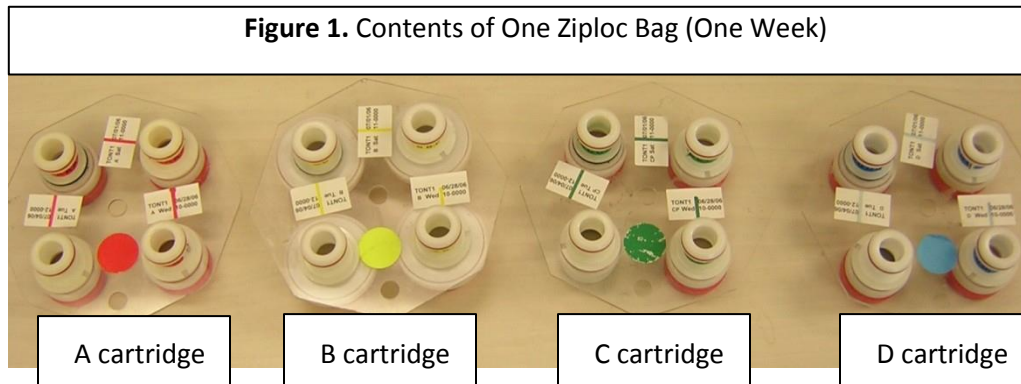
There should be two different color bins found below the "Post-Sample Processing" station, YELLOW and BLUE. YELLOW bins typically have yellow stickers with their site name listed, while BLUE bins have their site names on green stickers. Priority bins of either bin color have PINK site stickers. These receive priority at all stations. Bins of either color with WHITE site stickers are shipped through the United States Postal Service (USPS) instead of the United Parcel Service (UPS) (all bins designated with yellow, green, and pink site stickers are sent by UPS). White label bins receive the same priority as pink label bins because it takes longer for USPS sites to get delivered. Priority bins should be processed before normal boxes.

All yellow and blue bins have a site code that ends in a number (usually 1). In addition to the primary site code, some sites have an X module and are thus named SITE1-X. X filters are placed behind the main site filters in the bins and are to be processed/loaded/quality checked immediately after their corresponding main site filters.

### *3.2 Bin Contents*

#### 3.2.1 Primary Filters

Each yellow and blue bin should contain three Ziploc bags labeled Week 1, Week 2, and Week 3. Each Ziploc bag should contain four cartridges. There are four types of cartridges: A (red), B (yellow), C (green), and D (blue) (Fig.1). Each bag should have one of each type of cartridge. Cartridges contain three to four cassettes. The cassettes in A and D cartridges contain Teflon® filters. The cassettes in B cartridges contain nylon filters, and the cassettes in C cartridges contain quartz filters.



### 3.2.2X-Mod Filters

X-module bags contain only one type of cartridge. They can be any of the four types (A, B, C, or D). Each bin with an X-module contains three extra week bags for the X filters (Week 1, Week 2, and Week 3), with only one cartridge present in each bag.

### *3.3 Proper Cartridge Orientation*

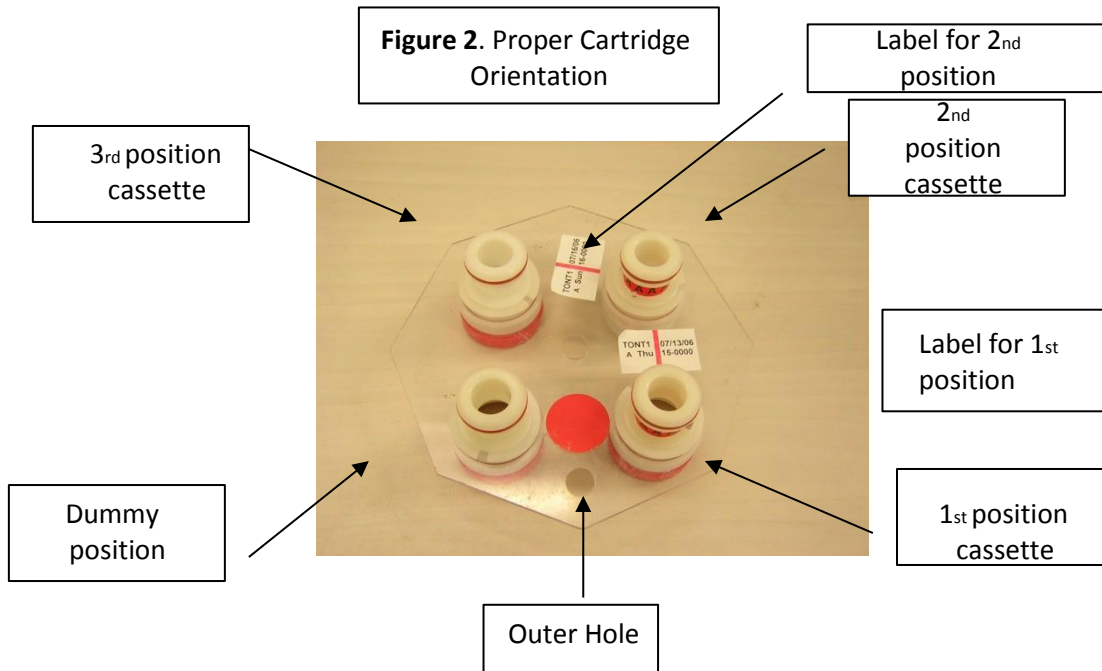
The proper orientation of the cartridge is with the labels facing up. There are two holes in each cartridge—one in the middle and one on the outer edge. If looking at the cartridge head-on, orient the cartridge so that the outer hole is facing 6 o'clock. Ensure that the color-coded circular sticker is above the outer hole, as this helps to orient the cartridge.

With the cartridge properly oriented, the sampling of the cassettes runs in a counter-clockwise manner. The bottom right cassette or the first position is always the first sampled followed by the top right (the second position) and then sometimes the top left (the third position) (Fig.2), depending on the week.

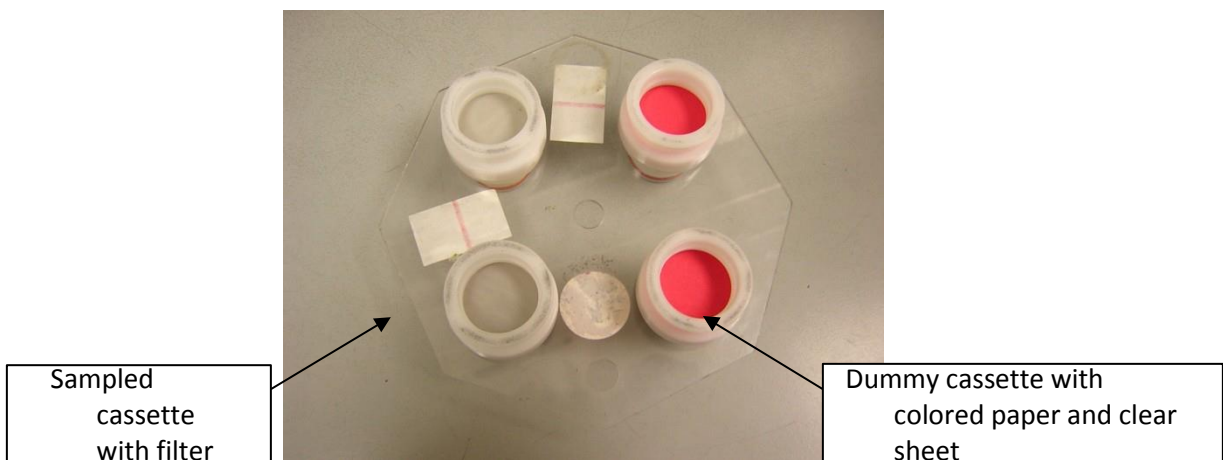
Two or three of the cassettes in each cartridge will have labels next to them. The label for each cassette can be found above in the picture. Printed labels contain the site name, the date of the sample, the sample day (Mon-Sun) and the cartridge type. Sometimes handwritten labels will appear in the third position. These are for field blanks, which are filters that are not sampled, but instead are used as controls. Handwritten labels will have the site name, sampling date, and cartridge type. Any unlabeled cassettes are considered "dummies" and do not contain any sample. Dummy cassettes contain a colored piece of paper and a clear circular sheet instead of a filter except for the B cassettes. For the "A" dummies, a red piece of paper and a clear sheet are used. The same protocol follows for "C" and "D" dummies, except that "C" dummies use a green piece of paper and "D" dummies use blue. The "B" dummies use two white circular sheets with the word "PALL" in blue writing. A dummy cassette can be identified by removing the red cap on the bottom of the cassette (Fig. 3).

All cassettes containing filters (except for the field blanks) should have a neck-tie around

the center. Neck-ties are thin stickers that contain both the color and name of the type of cassette they are for. For example, neck-ties for “A” filters are red and have “AAAAAAA” typed on them; neck-ties for “B” filters are yellow and have “BBBBBBB” typed on them, etc. All of the neck-ties should be facing upright except for the “D”. This sticker should be put on so that the typed Ds are upside down.



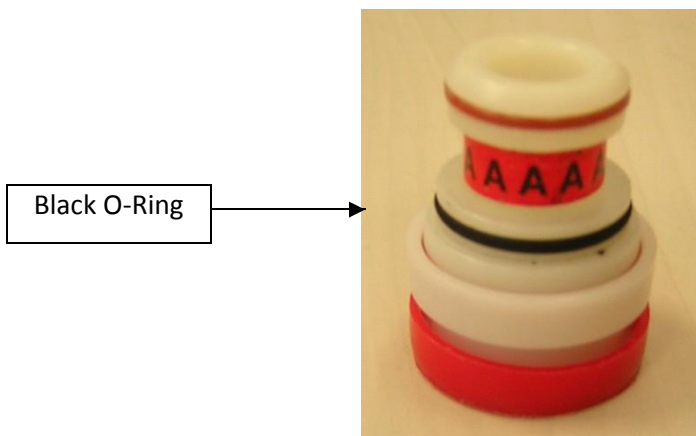
**Figure 3. Identification of Dummy Cassettes**





Some cartridges contain a cassette with a black rubber band, also called an 'O-ring,' around its center and label. The black rubber band allows this cassette to be manually moved between cartridges when necessary. The location of this movable position is dependent upon the box cycle.

**Figure 4. Movable Cassette (O-Ring)**



### 3.4 Box Cycles

There are two different types of box cycles, which are referred to as the 3-2'-2 and the 2-3-2'. Cycles can be identified based on the stickers found on both the bins and the boxes they are shipped in. 3-2'-2 have a green sticker with the site code printed on it on both the blue boxes and the blue bins. 2-3-2' have a yellow sticker with the site code printed on the bin and the box. The boxes have an orange circle sticker next to the yellow labels.

#### 3.4.1 1 3-2'-2 (Blue Bin)

3-2'-2 bins have three filters in the first week, two filters in the second week, and two filters in the third week. In the first week, the first two cassette positions contain a filter. The third position, which is the top left position, is a movable cassette (the one with the O-ring) containing a filter. A dummy is in the fourth position.

In the second week, there are filters in the first two positions. The third position is left empty. When the box is out in the field, operators remove the movable position found in the first week and insert it into this open space in the second week's cartridge. The empty space found in this cartridge is denoted by the apostrophe after the "2" in "3-2'-2." The fourth position is a dummy.

In the third week, there are two cassettes with filters and two dummies. This is the only week in which field blanks can be found for a 3-2'-2. They will be in the third position (top-left) instead of a dummy.

#### 3.4.2 2-3-2' (Yellow Bin)

2-3-2' bins have two filters in the first week, three filters in the second week, and two filters in the third week. In the first week, there are two cassettes with filters and two dummies. This is the only week in which field blanks can be found for a 2-3-2' bin. They will be in the third position (top-left) instead of a dummy.

In the second week, the first two cassette positions contain a filter. The third position (top-left) is a movable cassette, which also contains a filter. Operators in the field will remove the movable position and place it into the third week during their sample change. The fourth position is a dummy.

In the third week, the first two positions contain cassettes with filters, and the 3rd position is left empty. The movable cassette will be inserted into this space when it is out in the field. The empty space found in this cartridge is denoted by the apostrophe after the "2" in "2-3-2'." The fourth position is a dummy.

#### *3.5 The Quarter Naming System*

When filters are organized for analysis, they are separated into four different quarters based on the months in which they were sampled. Every quarter is given a three digit code for identification purposes. The quarter is identified by the month and the year. January through March are identified as A months, April through June are B months, July through September are C months, and October through December are D months. Therefore, there are four quarters in a year each labeled A, B, C or D. The last two digits of the year in which the quarter began are found after the quarter letter. For example, October of 2012 through December of 2012 would be D12, while January through March of 2013 would be A13.

**TI 251R** Data and Records Management

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## 1. PURPOSE AND APPLICABILITY

The purpose of this SOP is to describe the different databases, programs, macros, and other data connections used on a daily basis in the sample handling laboratory to manage, view, and organize data.

## 2. DATA AND RECORDS MANAGEMENT

Multiple databases, programs, and macros are employed in the initialization, tracking, and organization of IMPROVE filters. These are listed and briefly described below:

### *2.1 Databases*

The sample handling lab uses a variety of databases on a daily basis. All of them are SQL databases, primarily accessed by users through the Lab Application and the Web Application.

- **LOGS:** The LOGS database is organized to include all non-analytical data for a single site/sample date in one record. Each record includes all of the information from each module at a site for one sample date. Site, sample date, start time, temperature, pump vacuum for each module, initial and final orifice readings for each module, initial and final cyclone values for each module, elapsed time for each module, status of each sample, person entering data, date of log sheet entry, area of the sample, position number, quarter, protocol, persons that pre weighed and post weighed filters, date of pre weight and post weight, field blank channel, comments and/or flags on status, and flashcard numbers are fields included in the LOGS database. Data is written to LOGS through the Lab Application.
- **WEIGHTS:** The WEIGHTS database, tied to the LOGS database through the Lab Application, is organized to include the mass and identification data for each filter in a single record. Each record contains site, sample date, channel, status, pre weight, post weight, sample weight, pre weight time and date, post weight time and date, microbalance used for pre weight, post balance used for post weight, and persons entering the data.

Other databases used on a regularly by the sample handling laboratory are the Reference Weights and Lab Blanks databases.

- **Reference Weights:** The Reference Weights database is accessed through Reporting Services and is organized to include the initials of the balance operator, the date and time, the weight value, the magnetic field reading, the name of the microbalance, and any related comments.
- **Lab Blanks:** The Lab Blanks database is accessed through the Lab Application and is

organized to include the following information for each balance (Mettler 1 and Mettler 2); filter identification name; pre weight date; post weight date; number of days between the Pre and Post weighing of the filter; and initials of the balance operator responsible for each measurement.

One other database that is used less frequently by the laboratory is Lotnums.

- Lotnums: This "lotnums.accdb" database is located in U:\IMPROVE\Support. The database records the start date and time of a new lot of nylon or Teflon® filters. It also notes the SITE, SAMDAT, and sample start time of the first filter loaded when the lot number for a filter type is changed.

## *2.2 Macros and Other Data Connections*

The sample handling lab uses a variety of macros, reports, a web application, a web interface, and a data connection to perform vital tasks. These will be listed and described below.

- RH/TEMP macro: This Excel macro records live relative humidity and temperature data from a probe located between the Mettler balances every fifteen minutes.
- ION\_Contractors: This macro organizes nylon filters into sets of 400 filters for organization and shipping purposes.
- Carbon\_Contractors: This macro organizes quartz filters and is similar to ION\_Contractors
- FTIR\_Contractors: This macro is used to sort and organize "A" (PM<sub>2.5</sub>) filters into sets. "A" filters are analyzed by FTIR primarily in the order created by this macro.
- Problems\_Contractors: This macro is used to sort terminal status filters by quarter.

All of the Contractor macros store the set lists they create in folders labeled by analysis or filter type. All "B" filter set lists are placed in an "Ions" folder, all "C" filter set lists (including inactive-C's) in a "Carbon" folder, and all "A" filter sets in a "XRF" folder. The "Problem" tray lists are generated in a folder called Problems and are moved into a separate folder called "Closed" when a set is complete.

- Recent Problems: This macro is primarily used to track sites that have failed for the year or are close to failing and to see what kinds of problems are most common at each site.
- Improve Flow: Improve Flow is located in an Excel file and is used by lab and other IMPROVE personnel to graph flow data for any site in the network. Users have the ability to view each module separately with the acceptable range of values displayed on the screen, providing users a quick and easy way to determine if flow values are too high or too low. Users may also view all modules' flow data in the same chart. Finally, temperature values are also graphed for the users' convenience.
- IMPROVE Data Manager: This is a web application used to review flashcard data and then load it to the SQL database. The system will alert the user to any irregularities in the flashcard data, such as multiple UCIDS, time changes, or extended power outages.