Detailed Directions for Filling out Sensata Technologies, Inc. Material Content Reporting Form

Preface:

Material Content Reporting (MCR) is important to meet existing and upcoming legislation which currently includes RoHS, REACH, WEEE, Prop 65, etc. It is mandatory that use of watched or banned substances above certain threshold limits are reported up through the supply chain, such that goods sold to your customers, and ultimately to the end consumer are in compliance with all applicable laws.

With the ever growing list of "watched substances", "banned substances", and regulations, the easiest manner we see in keeping on top of these requirements is to obtain full material disclosure where ever possible. If full material disclosure of a supplied component is obtained at the homogeneous material level (including substances, their CAS #, and their % of weight), then no additional effort (other than occasional verification of the up-stream supply chain) should be required. Without full disclosure, any time new substances are added to a watch list (every 6 months for REACH), the entire supply chain needs to get re-exercised. Again, avoidance of this re-occurring effort only seems possible through full material disclosure.

Full material disclosure may result in findings of substances that are on a watched or banned list. This is OK, and is one of the intended results of these global initiatives. Depending upon 1) the substance, 2) the PPM level of the substance in the homogeneous material or the finished product sold, 3) the PPM level once the finished product reaches the end consumer, and/or 4) the regulation; the component may continue to be fine for sale, or it may need to be modified or re-engineered. The only way to know this is to have accurate material breakdowns and cooperation both up-stream and down-stream in the supply chain.

In the event that full material disclosure is not possible (either an inability to gather full disclosure from an upstream supplier, or for proprietary reasons), then the MCR Form should still be filled out with as much information as is known, listing the unknown substance(s) as "Un-declared" and noting its percentage of weight. If a portion of a homogeneous material is unknown or "Un-declared", then ideally the supplier can still provide a Letter of Conformance indicating that the Un-declared portion of the material is still in full compliance to all RoHS, REACH, etc. legislation as of a particular date. This would at least allow Sensata Technologies and our down-stream customers to confirm that the overall product is in compliance.

In the event that full material disclosure is not possible, and the "Un-declared" substance(s) can not be verified as being in compliance with REACH (for instance); then we must assume that the percentage listed as "Un-declared" is in fact a possible SVHC, and report it as such to our down-stream customers. Although this is not anyone's first choice, it may not be the end of the world, as long as the percentage of weight is small compared to the end weight of the product that Sensata Technologies makes, or even the

end consumer product. For this reason, even if a homogeneous material or component sold to Sensata Technologies has "Un-declared" substance(s) in it; **it is still important to report the materials that are known, and the percentage of the "Un-declared" substance(s), such that the down-stream users can determine if a potential problem exists, or not.**

The below directions are meant to answer any questions that may exist with the Sensata Technologies, Inc. – Material Content Reporting spreadsheet. The spreadsheet was designed to handle the vast majority of our purchased components without becoming too intimidating or confusing. **For items that are purchased in strip form** (ie. contact tape, insulated wire, gasket material, etc…) **the vendor should base their analysis on a 100cm length of material** for their measured weight or their calculated weight information.

As an example, for components made out of a single homogeneous material (ie. 1008 Cold Rolled Steel), filling out the form is as simple as entering the top information block, the measured weight of the finished component, and then choosing the homogeneous material ("1008 CRS" in this example) from a drop down list in which the manufacturer will list the substances, CAS #, and % of substance by weight for each homogenous material. The CAS# and % weight is extremely important, because the CAS # (a unique number for each chemical substance) will ultimately be used to perform automatic searches against watched/banned substance lists, and the percentage is necessary to determine the PPM of the substance in the homogeneous material. Although entering this substance breakdown may take some up front effort, once it is in the Drop Down List, it can be re-used over and over again for different components just by clicking on the material description from the drop-down list. The example for "1008 CRS" may include the following substances depending upon the supply source:

Substance	CAS #	% by weight
Iron	7439-89-6	99.32%
Carbon	7440-44-0	0.10%
Manganese	7439-96-5	0.50%
Phosphorus	7723-14-0	0.03%
Sulphur	7704-34-9	0.05%
Un-declared	???	0.00%

The substance and % by weight is information that should already be supplied by the raw material supplier as part of their material certs. Most material certifications that we have seen do not include the CAS # for each substance, so this information will have to be added. A list of some commonly used chemical substances and their CAS numbers are provided in the "CAS #'s" tab of the spreadsheet. This can be added to or subtracted from by the supplier as they see fit, and can be used to cut and paste substance and CAS# information into the "Drop Down List" tab, as homogeneous materials are broken down into substances (described below). A more extensive list of CAS # for substances can be found at the attached website: http://www.epa.gov/enviro/html/emci/chemref/complete_index.html

or

www.cas.org/

Detailed Directions for filling in the Sensata Technologies, Inc. – Material Content Reporting spreadsheet:

1) Enter information into the yellow boxes at the top of the spreadsheet as follows:
   Sensata Component #: Must be the Sensata Part # being analyzed
   Dwg Rev: Must be the latest print revision which has been released, and for which the material content reporting is being made
   Component Description: Description of the component supplied (can be the wording in the TITLE block of the Sensata drawing)
   Vendor ID: Either DUNS or a unique vendor/supplier ID number
   Vendor Name: Vendor or Supplier Name from whom we purchase the Component # specified
   Vendor Address: Vendor's mailing address. Use commas to separate different information (ie. street, city, state, country, postal code) in the address block.
   Vendor Contact Name: The person who should be contacted if Sensata has questions regarding the Material Content Reporting form
   Job Title: The job title of the Vendor Contact Name
   e-mail address: The e-mail address of the Vendor Contact Name
   Date: Enter the date the spreadsheet is filled out in mm/dd/yy format

2) The orange input box tied to "Component Wt. in Oracle (g)" is to be filled in and used by Sensata Technologies only.

3) Breakdown of Homogenous materials by percentage of Substances contained within. Because RoHS reporting requires that components be broken down into their smallest possible homogeneous materials (as can be physically separated), the yellow boxes for Materials and Coatings should be input with this "smallest homogeneous level" in mind. Clicking on one of these yellow Material or Coating boxes will bring up an arrow on the right side of the cell. Clicking on the arrow will bring up a drop-down list of Homogenous materials to choose from. Scroll through the list until the proper material is highlighted. Clicking on the highlighted material will enter the material, and it's substance breakdown information into the main spreadsheet. Entries are made in the second tab of the spreadsheet (titled "DROP DOWN LIST").

   This drop down list is the only means to enter materials and coatings in the yellow boxes, and will need to be expanded by vendors/suppliers to take into account substances that exist within their specific material supply chain. **It is expected that our supplier will enter this information based on actual information obtained from material certifications or the like from their up-stream suppliers, such that the information fed down the supply chain is accurate.** As it is reasonable to expected some small fluctuation in the percentage of substances based on different material lots, an average value should be chosen for reporting purposes. **These substances must include trace elements within an alloy, as well as any residuals left on the materials after processing.** If any substance(s) are on a banned or watch

list, then the maximum % by weight of that substance(s) should be used (such that we clearly understand the possibility of exceeding the PPM of a banned or watched substance). If this forces the sum of the substances over 100%, then subtract any overage away from the substance with the greatest percentage. (For example, the entry for 1008 CRS has a calculated value for Iron which is equal to 100% minus the percentage of all the other listed substance percentages. This formula can be copied to new cells if it is helpful.)

It is recommended that a supplier add their most commonly used homogeneous materials and substance break-downs to this Drop Down List before starting. Once entered, these can be used for multiple components sold to Sensata that may use the same materials and source of supply.

a. Although the entry of 1008 Cold Rolled Steel is in this drop down list as an example, it and the other Homogeneous Material examples should only be used after a Vendor has modified the Substances, CAS #s, and % of weight of the substances based on their supplier base and processing additions.

b. Each of these Homogeneous Material entries must contain a break-down of the substances, the CAS # of the substance, and the % of weight of the substance in the material.

c. **Always end a material entry with the substance "Un-declared", and include a percentage, even if the value is 0.00%.** This helps verify that all prior substance entries total up to 100, that CAS numbers do in-fact exist for all substances, and that additional Letters of Compliance are not necessary for the component because of the 100% substance disclosure.

d. If for some reason a CAS# does not exist for a substance, then that substance should be denoted as "Un-declared", and it's percentage of weight should be noted appropriately.

e. If for some reason not all substances of a material are called out, or they are noted as "not to be disclosed", or some other terminology (due to the proprietary nature of the chemistry or some other reason); then this needs to also be denoted as an "Un-declared" substance with the percentage by weight appropriately noted.

f. Homogeneous Material names that are chosen for Column A in the Drop Down List should be specific. For example, there are various types of Brass, and each type will be made up of different substances, trace elements, and/or percentages of these substances. If a supplier uses 5 different types of brass across a variety of Sensata products, then the addition of all 5 to the drop down list with specific Material Names will make it easier for the supplier to choose the correct brass material with the accurate breakdown during analysis of the various components they supply.

g. REACH requires reporting substances down to a 0.1% or 1000 PPM level. RoHS has similar threshold limits on all banned substances with the exception of Cadmium at 0.01% or 100 PPM. JIG A and B Material Lists have threshold limits set down to 30 PPM on some substances, and Japan has been known to limit acceptable substance PPM limits below the 1000 PPM threshold. This should be used as a guide in terms of reporting trace elements.

Anything at 0.1% or greater must be reported. Weight percentages below 0.1% should also be included if known, especially for any banned substances, or substances on a watch list (such that any reductions in allowable limits with future legislation can be addressed in the shortest possible time).

h. If during the creation of the substance breakdowns the density of the homogeneous material is known, it may be useful to add it to Column B. (This will be useful if the weight of the homogeneous substance has to be calculated). Enter the density in g/cm3 (if in lb/in3, use the "Helpful Equations & Conversions" tab to convert to g/cm3). The Density will not self-populate the calculation sheet, but column B can be used as a convenient storage location for the information if needed.

Once the Homogenous Materials are entered into the Drop Down List in the 2nd tab with accurate substance breakdowns and percentages by weight, then the appropriate material can be chosen for the homogeneous Material and Coating boxes highlighted in Yellow on the "Entry & Summary Sheet" tab. When a material from the Drop-Down List is picked, the substance breakdown information will be automatically populated into the main sheet for calculation purposes.

Be sure to choose "None" from the drop down list for any of these yellow boxes that are not used.

4) RoHS Exemptions: If a homogenous material or coating itself, or substances within the homogenous material or coating is on the RoHS restricted list, then these materials need to be brought to the attention of Sensata Technologies. In certain cases, the use of RoHS restricted substances is allowed under specific exemptions. If any homogeneous material or substance within is allowed per RoHS exemptions, please list the exemption(s) that apply in the yellow boxes under the title **RoHS Exemptions**. If more than one exemption applies, use a comma between the exemption numbers. Including this information will help prevent a red-flag during automated analysis of the data. The last tab on the spreadsheet "RoHS Exemptions List" is a helpful guide of the latest exemptions in place as of 2009.

Examples:
   i. For Cadmium Oxide used in a contact, "8" would be typed in the box to represent acceptable use based on exemption # 8
   ii. For Lead found in brass material, "6c" would be typed in the box to represent acceptable use in a copper alloy containing up to 4% lead by weight

5) Material Weights: Material Weights can either be Calculated using the Blue Boxes, or Measured using the Green Boxes, and mainly depends on the material make-up of the component.
   a. If a component only contains 1 homogenous material, then it is easiest and most accurate to weigh 10 or more parts, divide the total weight by the

number of parts, and enter the average material weight in the corresponding Green box in the units specified.

b. If a component contains more than 1 homogenous material (ie. a clad material), then the weight for each homogenous material should be calculated. Enter the material volume (based on geometric shape) and the material density for each of the separate homogenous materials in the Blue Boxes in the units shown. This will automatically calculate a weight for each homogeneous material. (The "Helpful Equations & Conversions" tab in the spreadsheet has some equations for basic geometric shapes which may be helpful.)

    i. If actual geometric measurements can be made, then these should be used in determining the volume.

    ii. If actual geometric measurements can not be made, then nominal print dimensions should be used for these calculations.

c. If the component is purchased in strip form (ie. contact tape, insulated wire, gasket material, etc…) the vendor should base their analysis on a 100cm length of material for their measured weight or their calculated weight information.

Be sure to highlight any blue boxes with volume, density, surface area or thickness data that are not being used and either a) hit the DELETE key, or b) right click on your computer mouse and click on the "Clear Contents" line in order to clear the old information. If you try to clear old information by hitting the space bar, it will give a "#VALUE!" error in the calculation area and will interfere with proper spreadsheet function.

6) Coating Weights: Coating Weights can also either be Calculated using the Blue Boxes, or Measured using the Green Boxes.

a. As many coatings are very thin and likely do not weigh an appreciable amount, if coatings are to be measured, the sample size should be 100 pcs or more. Weigh the same exact items before and after the coating is applied, and divide this total weight difference by the number of parts, then enter the average coating weight in the corresponding Green box in the units specified.

b. If there is more than 1 coating, and it is not easy to weigh the samples in-between coatings; then it may be easier to calculate the weight of the coating(s). In this case, enter the surface area of the component being coated/plated, the thickness of the coating material, and the density of the coating material in the corresponding Blue boxes in the units shown. This will automatically calculate a weight for each homogeneous coating material. (The "Helpful Equations & Conversions" tab in the spreadsheet has some equations for basic geometric shapes which may be helpful.)

    i. If actual geometric measurements can be made, then these should be used in determining surface area and coating thickness.

    ii. If actual geometric measurements can not be made, then nominal print specifications should be used for these calculations.

c. If the component is purchased in strip form (ie. contact tape, insulated wire, gasket material, etc…) the vendor should base their analysis on a 100cm

length of material for their measured weight or their calculated weight information.

7) Component Weight Total Calculated: A combination of calculated and measured weights can be used for the different materials and coatings on the same sheet; but use only one method per individual Material or Coating attribute. A "Component Weight Total Calculated (g)" will be calculated in Row 39, Column B; which is the summation of all the calculated and measured weights on the sheet. For this reason it is important not to have both a Calculated Weight and a Measured Weight for a single material or coating, and it is important to clear the contents in any of the blue boxes for which the Material or Coating material is listed as "None". Otherwise, a warning box will be generated.

8) Component Weight Total Actual: As accuracy is an important part of this process, it stands to reason that ultimately, any calculated information ought to add up to the actual weight of the finished component which is purchased by Sensata Technologies. As verification that all values, calculations and conversions are accurate, an average of 10 or more completed components as shipped must be measured and entered into the yellow box located at row 39, column F.
   a. If any Calculated Weights were used above, then this is a good check to verify calculated results against actual results.
   b. The box located between the "Component Weight Total Calculated (g)", and "Component Weight Total Actual (g)" shows the delta between Row 39 - Column C and Column F.
   c. If this box is green, the weight difference is less than or equal to 1%.
   d. If the box is red, the weight difference is greater than 1%, and information used in the calculation should be verified for accuracy. Possible errors include:
      i. Old data in the blue "Calculated" boxes that was not cleared
      ii. An entry in the Drop Down List which does not add up to 100%
      iii. Incorrect Volume, or Density information entered in the blue Material Calculation boxes
      iv. Incorrect Surface Area, Thickness, or Density information entered in the blue Coating Calculation boxes
      v. A missed Material or Coating entry
   e. If an accuracy check is performed, values are corrected, and there is still a red box at Row 39, Column C, then enter comments for the weight difference in column K (if known). (This difference may exist based on a calculation using the maximum volume, thickness, or percentage of a "banned" or "watch-list" substance that must be accounted for in the calculation; but is different than the actual component.)

9) Run Macro analysis: Once the above entries are all complete, then the Run Macro button (located in Row 41, Column I) should be clicked. This will take all of the substance ratios for the materials and coatings and multiply them by their calculated

or measured weights; and consolidate the total weight of any single substance in the component. The Summary is shown in the table below the Run Micro button.

Logic Boxes:

10) The first Logic Box was already described in Section 6, and compares the sum of the Calculated and/or Measured Weights against the average weight of actual finished product shipped to Sensata.
   a. If only measured weights (green boxes) are used in the material breakdown, then these two boxes should hold identical values, and the logic box between them in Row 39, Column C will be green.
   b. If the box is red, the weight difference is greater than 1%, and information used in the calculations should be verified for accuracy.
   c. If an accuracy check is performed, values are corrected, and there is still a red box at Row 39, Column C, then enter comments for the weight difference in column K (if known).
11) The second Logic Box is located in Row 42, Columns A&B. It looks at all Materials and Coatings chosen for the component and determines if there are any substances listed as "Un-declared" with values greater than 0%. If so, the logic box will turn red, and text will appear in Row 43 asking the Vendor to "Attach Letters of Compliance at Line 70". The significance of attaching Letters of Compliance at Line 70 is only to avoid covering the logic boxes and Summary area when printing hard copies of the information. If a separate Letter of Compliance is required, then this box can not be turned green. It is OK to submit the sheet back to Sensata with this box as red; but it requires that additional Letter(s) of Conformance be returned as well for any "Un-declared" substances with weight percentages above 0.1% (1,000 PPM).
   a. To attach a Letter of Conformance to address "Un-declared" substances, follow the below instructions:
      i. you must first Un-Protect the Sheet. Do this by clicking on "Tools" in the excel tool header, then scroll down over Protection", and click "Unprotect Sheet…". The sheet is now un-protected, so be careful not to change anything by accident.
      ii. Click on the box in Row 70/Column A, then click on "Insert" in the excel tool header. Select "Object…", click on the appropriate document type, and then find and attach the document.
      iii. To avoid any accidental changes to the sheet, it is suggested that the Sheet be re-protected by reversing step a). Click on "Tools" in the excel tool header, then scroll down over "Protection", and click on "Protect Sheet…" Click "OK" in the pop-up box, and the sheet will again be protected.

   b. **OR**, if it is easier to include Letter(s) of Conformance as a separate attachment at the same time this form is submitted; this is an acceptable alternative as well.

12) The third logic box is located in Row 42, Columns D&E and shows the Weight Delta in grams between the sum of the Calculated and/or Measured Weight, and the sum of the substance weights in the Summary Section. If a Red box results here the gram difference will be shown in the box. This box must be green before submittal of the information back to Sensata. If the box is red, check the following:

    a. Homogeneous Material breakdowns in the Drop-Down List that are used for the component breakdown need to have substance percentages by weight that add up to 100%. Hint: Check column BM in the Drop Down tab for the material breakdowns to see if they add up to 100%.

    b. Verify that any yellow Material or Coating boxes that are not being used have "None" in them from the drop-down list; and that the corresponding blue boxes used for calculating weight have their contents cleared where "None" is specified.

    c. Until the Run Macro box is clicked, the box will likely remain red. Or, if changes have been made after the Run Macro box has been clicked, then the box may turn red. Hint: Always click the Run Macro box after any changes are made in the spreadsheet after initial data entry.

13) The forth logic box is located in Row 46, Column B, and is meant to red-flag any instances in which substances or percentages by weight vary between alternate raw material suppliers, or even different materials that are allowed to be used for the component being analyzed. If the difference is significant, then either 1) the vendor needs to supply a second spreadsheet with full information that covers the alternate, and/or 2) Sensata Technologies needs to consider whether an individual part number is necessary to cover the alternate and subsequent differences. As this is intended to initiate additional discussion between Sensata and the vendor, it is permissible to submit the spreadsheet with a red box – just be prepared to explain why there is an alternate, and what the difference in substances and/or substance percentages are.

14) The fifth logic box is located in Row 46, Column F. As it is tied to an Orange box, it is only to be used by or be a concern to Sensata Technologies. This box compares the existing component weight in Sensata's Business System (noted in Section 2) to the "Component Weight Total Calculated (g)". If a difference of greater than 5% is observed, the logic box will turn red, and it is suggested that the standard be changed. As returned by the vendor, this box should read "#VALUE!".

Examples of Attached Files:

1) The first example (16438-1 MCR Entry – Example.xls) shows a simple device made with a single homogeneous Material (1008 Cold Rolled Steel), and a single homogenous Coating (Electroless Nickel plating). Average weights of the components before plating, and then after plating are filled in boxes F12 and F39 respectively. The difference is the weight of the plating which is entered into box F26 in the spreadsheet. After pressing the Run Macro box, all logic boxes turn green, and the form is ready for submission.

2) The second example (24076-1 MCR Entry – Example.xls) shows a three layer clad product which is supplied to Sensata in strip form. In this case, calculated weights were made based on thickness ratios of each of the different homogeneous layers. As noted in Direction step 4 of the abbreviated directions on the spreadsheet (or in the detailed directions), because this is shipped in strip form, the weight calculations are based on a 100cm length. Likewise, the actual weight would also be based on a 100cm sample length. Also worth noting is the RoHS Exemption box for the AgCdO material. An "8" has been entered into the box to signify that Exemption 8 comes into play for the material in this product (the allowance of Cadmium and it's compounds in electrical contacts).

3) The third example (40124-5 MCR Entry – Example.xls) is a molded component made from Celanex® material, with no other additives. The plastics manufacturer lists 85% of the material to be made of Polybutylene Terephthalate, with the remaining 15% as Undeclared. Note the red Logic Box in location A42 on the spreadsheet, and the request to attach Letters of Compliance at Line 70. Also note the attachment from the plastics supplier indicating REACH compliance for the Celanex® at line 70. This Letter of Compliance was good up until the addition of SVHC's in January 2010, which means a new letter of declaration will have to be obtained, unless the plastics supplier is willing to provide 100% material disclosure.

Please note that the "CAS #", "Helpful Equations & Conversions", and "RoHS Exemptions List" tabs have been removed from the above example sheets to help reduce file size. The same can be done prior to supplier submission to Sensata Technologies if so desired.

When saving a file for submission, please name the file as such: Part Number (including any dash numbers) MCR Entry.xls . Example 1 above becomes **16438-1 MCR Entry.xls**

If there are any questions with respect to filling out the Material Content Reporting form, please call your local Sensata Technologies representative, and we will get an answer to you.

Although the spreadsheet is copyright protected by Sensata Technologies, if vendors do not have their own system in place, and require information from their up-stream suppliers, then this form and instructions can be used by our direct vendors for informational gathering purposes only.