

Tracking Material Composition Data



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How a new jointly authored standard may automate and simplify the format for the entire supply chain.

To demonstrate compliance with environmental regulations, manufacturers must have information about the material composition of components and bulk materials that go into their products. However, few companies are able to efficiently collect, track and report electronics product material composition data. Regulatory requirements for product material data are matched by requirements from OEMs and customers. Suppliers currently receive requests for product material data in multiple formats – often in the form of lengthy questionnaires – and are responsible for collecting data from their own suppliers. Data are often incomplete and inaccurate, and response time is slow, requiring followup effort. The industry desperately needs an efficient means of collecting these data.



Global efforts have been underway for more than a year by iNEMI, IPC and RosettaNet to simplify and standardize how the industry collects, tracks and discloses product material content information. From these efforts has come a draft standard, IPC-1752, Materials Declaration Management, that will establish electronic data formats and provide standardized forms to simplify the exchange of materials declaration information. This draft integrates and leverages existing efforts, including recommendations from the iNEMI Materials Declarations and Material Composition Data Exchange projects, RosettaNet's e-business process standards for material composition and the Joint Industry Guide for Material Composition Declaration, developed by EIA, EICTA and JGPSSI and as of this writing expected to be released in early May as an EIA/JEDEC standard.

IPC-1752 outlines a supply-chain materials declaration format and process that provides a simple, effective approach to assist companies in meeting environmental regulation compliance. The standard also provides a material content declaration (MCD) form, which will simplify and improve material composition data exchange throughout the supply chain, driving cost savings and efficiencies. It will be under IPC revision control and available from IPC (ipc.org).

Data collection process flow. The iNEMI Materials Declarations Project team defined a data collection process flow (**Figure 1**). This flow assumes that the OEM (requestor) initiates MCD requests to its direct suppliers to establish necessary documentation of compliance. Tier 1 suppliers are expected to collect required data from their suppliers, and so on down the chain. This process flow will be included in IPC-1752 as a recommendation for users to follow.

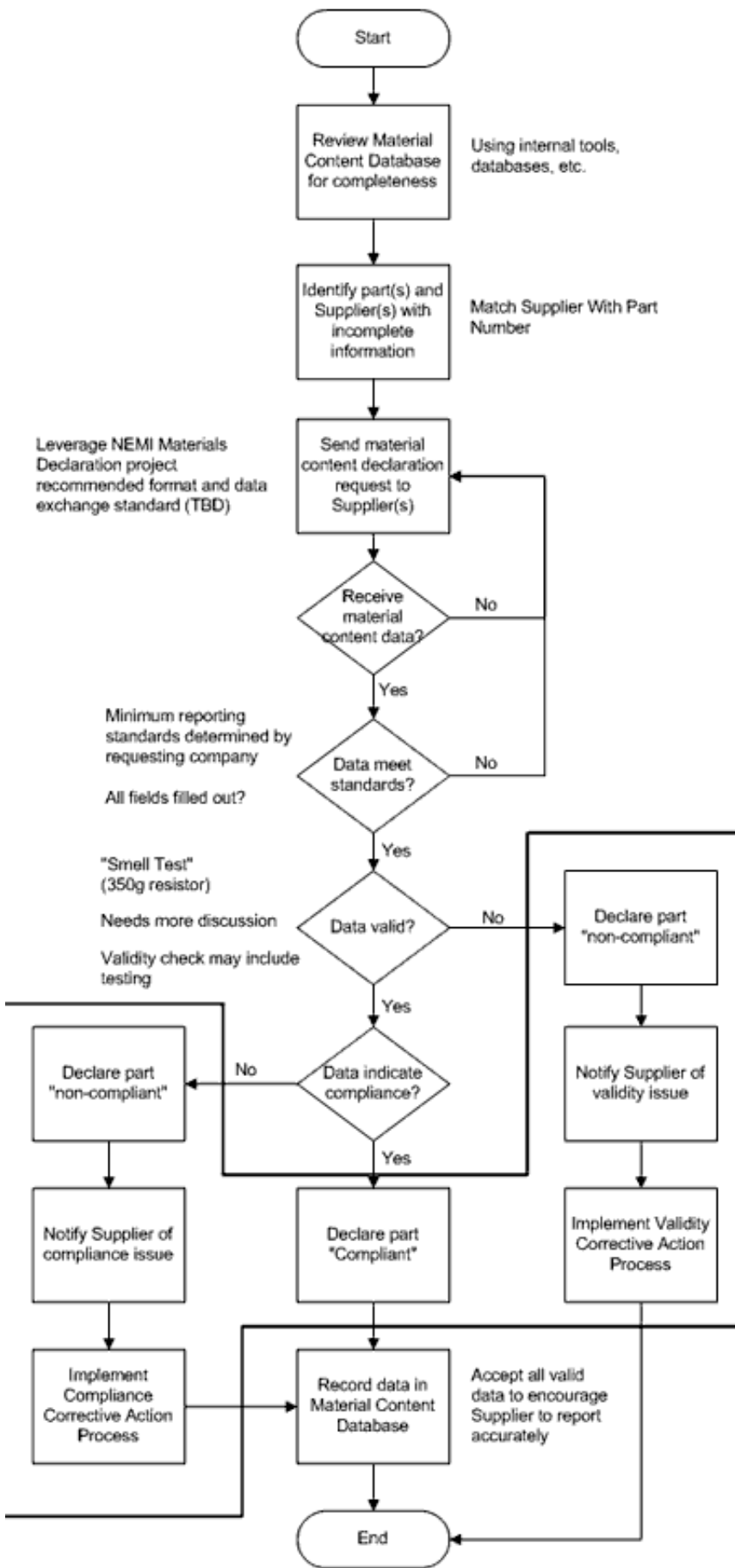


FIGURE 1: The recommended process for collecting required material content data per IPC-1752.

IPC-1752 includes a data model that builds on the JIG as well as work done by iNEMI and RosettaNet. The model represents all required data elements and their relationships, data types, etc. It supports request-response exchanges, as well as supplier self-declarations, or “publish” models; it also supports three declaration levels (see Tracking Material Content, below).

The data model also defines the XML schema that forms the structure of data exchange messages. The IPC-1752 XML schema is aligned with current RosettaNet practices and will be consistent with RosettaNet PIPs 2A13 (Distribute Material Composition Information) and newly created 2A15 (Request Material Composition Information).

Material declaration content requirements. iNEMI project teams recommended leveraging the JIG for material and substance reporting requirements, including reportable substance lists, reporting thresholds and other reporting requirements. The JIG substance lists are meant to provide a comprehensive view of regulated or potentially hazardous substances across all major markets, and are divided into two levels. Level A includes substances banned or restricted in electronic equipment (including the six RoHS substances). Level B includes the substances deemed by industry to represent a potential environmental, health or safety risk, which, at end of life, may require disclosure as hazardous waste or warrant special handling.

Some OEMs and customers are requesting disclosure of additional substances not currently on the JIG Level A or B lists. iNEMI project teams refer to these substances as “materials of interest,” and suggest that a JIG Level C be defined to manage them. The Level C list would not be an explicit, finite list, but would provide the same data fields for reporting as levels A and B. The requestor would be expected to identify any additional substances they wanted suppliers to include in the declaration. In some cases, requests are being made for “full disclosure” – in effect, expanding the list of materials of interest to include all materials and substances used in the part. Although this level of reporting is not universally recommended by the iNEMI teams, some companies are requesting it. Currently, this level of reporting is not required by legislation, and it would place an unnecessary burden across the entire supply chain. In addition, many suppliers are reluctant to disclose the information since it is viewed as proprietary to their product.

Additionally, companies are requiring explicit declaration of RoHS compliance. This is specific to the six RoHS substances, as well as to the manner in which the EU is defining the maximum concentration values as related to their definition of “homogeneous materials.” While the definition and, more importantly, interpretation of this definition with regard to material declarations requirements is still being discussed, companies are anxious to start collecting data.

Material content declaration form. The data exchange format and overall material declaration process outlined by IPC-1752 are reflected in the supporting MCD form. It will provide a practical, industry-standard tool for sharing material composition data across the supply chain.

The MCD form supports material content declarations to meet RoHS requirements. It uses JIG data fields as a baseline and integrates the mandatory and optional data fields from some of industry’s most relevant approaches: Compliance Connect spreadsheet, Japanese Green Procurement spreadsheet and RosettaNet 2A10 (Distribute Design Engineering Information) and 2A13 PIPs.

The form also builds on work done under the RosettaNet Auto Enablement (RAE) program, where forms are being developed to provide a human interface to established RosettaNet B2B processes. Through coordination with RosettaNet, the form will be consistent with the 2A13 and 2A15 PIPs, allowing B2B automation and automated extraction of XML data from the form into an internal database or flat file (no manual reloading of data).

The MCD form is in Adobe PDF. It is based on an underlying XML schema, which in turn is represented by a UML data model. Data entered into the form automatically conform to the schema requirements (because the form design tool binds the schema elements directly to the form fields), thereby ensuring a higher level of data quality. It can be exchanged by email or more secure transfer mechanisms or interactively linked for B2B exchange. Using Adobe Reader, users can save a completed form, attach supporting documents to the form (e.g., lab analysis), import/export XML data and provide digital signature. With declarations automated via the common PDF form, product material data can be collected, analyzed and reported faster, at lower cost and with fewer errors.

Tracking material content. The MCD form will cover three levels of declaration (defined below) and two use cases: 1) broadcast/distribute declaration (no requestor, supplier self-declaration, can be distributed through posting on a Website or publishing server-to-server) and 2) request/response declaration requester/OEM initiated and responder). It will provide support for bulk material, component, sub-assembly and finished product level reporting.

With three levels of declaration, requesters can choose the level of disclosure:

Part number level RoHS compliance declaration. This level permits a manufacturer to provide a standard declaration that indicates that the part specified is RoHS compliant and also provides indication of any exemptions that may be involved in meeting compliance.

JIG substance level declaration. This level will support disclosure of substances that are referenced in the JIG levels A and B, as well as supporting Level C. JIG levels A and B substances are selected via drop-down lists, which also auto-fill the related CAS number, simplifying data entry and providing fewer errors. In this declaration, total amounts of the substances are reported. This level is suited to very complex components, sub-assemblies and assemblies. It is additive to the RoHS compliance declaration.

JIG homogeneous material level declaration. This level will support disclosure of JIG substances at the homogeneous material level, pending final resolution of definition. It also supports JIG levels A, B and C. In this declaration, amounts of the substances are reported at the homogeneous material level, as per the RoHS definition. This declaration is best suited to components and electro-mechanical elements (i.e., metal frames, cables). It is also additive to the RoHS compliance declaration. In general, either JIG substance or JIG homogeneous material would be requested or provided, but not both.

The form is common between all three declaration levels. The only differences are the level of detail in the body section. The header provides requester-responder and part identification information. For the body, the requester selects the preferred level of disclosure in a first-time set-up. This one-time step will “hide” any fields that are not required. Details increase from each level to the next (RoHS to JIG substance to JIG homogeneous material). Technically, both JIG substance and JIG homogeneous material level declarations could be extended to provide full disclosure, but again this level of detail is not recommended. The footer includes certifying contact information, supplier digital signature and a default compliance statement.

Another section provides manufacturing-related information for components, which can be enabled as required. This section provides information commonly required for the processing of lead-free components, which involves different processes and reflow temperatures.

Figures 2 through 4 highlight various features of the form. The form provides for a single or multi-part disclosure. Internal database fields can be mapped with the form fields for automated data upload and extraction.

FIGURE 2: The header from the IPC-1752 MCD (material content declaration) exchange form.

FIGURE 3: The company issuing the request for information can specify the type of declaration it requires.

Request for Information						Lock Request Fields
Request Date	Request Document ID	Internal Part Name	Internal Part Number	Contact Name		
Company Name		Manufacturer Part Name	Manufacturer Part Number	Contact Title	Contact Phone	
Company Unique ID	Unique ID Authority	Manufacturer Part Version	Manufacturer Effective Date	Contact Email		
Digital Signature of Requester		Manufacturing Site	Requester Comments			

FIGURE 4: The request for information portion of the MCD exchange form.

The form can be exchanged via electronic means, from email or Web interfaces to advanced and secure B2B methods. Automation can be introduced for form generation (request or distribute) as well as form response, provided that the relevant data are accessible programmatically. If data fields in the form (each of which have unique identifiers) are mapped with matching data fields in a company's internal systems, XML can be automatically extracted from the form into the internal database. For reporting to customers, XML data can be automatically uploaded from the company database into the form. A check step can be built in to allow an engineer to review the data before they are loaded into the database. Further, as the XML output of the form complies with RosettaNet PIP 2A13/2A15 XML, there is a direct path for complete B2B automation using RosettaNet.

Suppliers need only complete the form once for a specific part and revision, then save the XML. Form requests for data on the same part can then be completed via a simple XML data import.

The initial draft IPC-1752 data model and form underwent limited trials with a number of participating companies during April and May. The draft standard is to be released for a 60-day industry review on June 1. Once all feedback has been reconciled, the standard will be issued. In parallel, efforts are underway to harmonize IPC-1752 with other relevant standards and guideline activity, including IEC TC111, the JIG and RosettaNet.

Resources

1. iNEMI Materials Declarations and Material Composition Data Exchange Projects, inemi.org.
2. IPC-1752, Materials Declaration Management, ipc.org and ipc.org/committeedetail.asp?Committee=2-18.
3. EIA/JEDEC, *Joint Industry Guide, Material Composition Declaration*, May 2005 (draft available at eia.org/resources/2003-09-19.10.pdf).
4. RosettaNet, rosettanel.org.

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