

NEMI Materials Declaration Project Phase 1 Results

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August 31, 2004



Phase 1 Team Acknowledgement

- **Allan Dobney, Cisco**
- **A. Priebe, Centor**
- **Andrew Wertkin, Synapsis**
- **Alan Ater, Sanmina-SCI**
- **Barry Gross, Plexus**
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- **Bert Honour, Centor**
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- **David Godlewski, NEMI**
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- **Diane Fisher, HP**
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- **Joey Campbell, Kemet**
- **Kurk Kan, Motorola**
- **Kara Thompson, Dell**
- **Keith Gray, EMT**

Connect with and Strengthen your Supply Chain



Phase 1 Team Acknowledgement

- Laura Przekop, URS
- Lonnie Gillihan, Synapsis
- Linda Scala, Celestica
- Marissa Yao, Intel
- Mark Myles, Goodbye Chain
- Martha Coopersmith, Agere
- Marty Rodriquez, Jabil
- Martin A. Thomas, Intel
- Michael McMannus, Agilent
- Mike Young, Agilent
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- Nancy Bolinger, IBM
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- Pete Elmgren, Molex
- Philip Trowbridge, AMD
- Phil Koch, Lucent
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- Rich Kassis, HP
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- Steven P Willis, Whirlpool
- Todd A Brady, Intel
- Todd Okrasinski, Lucent
- Ted Haas, RosettaNet
- Thomas A Martin, Intel



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Project Background

The NEMI Materials Declarations Project, initiated in late 2003, ran a set of pilot tests, leading to recommendations for an Automated, Industry Standard Materials Declaration process

The objectives were to recommend a standard materials declaration process and toolset that:

- **Aligned with the Joint Industry Guide (JIG)**
- **Focused on the legally banned and restricted materials in JIG Annex A, Annex B optional**
- **Included an automated reporting process with minimal supply chain cost impact**



Project Schedule

- **Project Initiated** **November 2003**
- **Agreed on materials list to pilot (e.g. Annex A, not B)** **December 2003**
 - **Agreed on tools to use** “
 - **Agreed on products/components to test** “
 - **PCB and add housing with metal and plastic parts** ”
 - **Motorola provided the design** “
- **Review of Existing Tools**
 - **The Goodbye Chain Material Declaration Wizard** “
 - **Centor Compliance Connect™ and X-Sight™** **January 2004**
 - **Synapsis EMARS™** “
 - **Agere** **February 2004**
 - **PDX 2.0 standard** “
 - **JGPSSI** “
 - **Agile** “
 - **RosettaNet lite** **March 2004**
- **Pilots completed** **April 2004**
- **Phase 1 report issued** **May 2004**
- **Phase 2 Project launched** **May 2004**

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Pilot Process

- 1. Reviewed existing tools and standards**
- 2. Data collection: started with a blank BOM and chose at least 5 components. Requested data for these components from 5 suppliers and asked the suppliers to respond to the supplier questionnaire regarding ease of use, data entry experience**
- 3. Data exchange: from at least 3 tiers of suppliers, populate the blank BOM using the software tool**
- 4. Data analysis and reporting: provided 2 electronic materials declaration reports at the product (PCB part) and component level. Ease of use, scalability, reporting scheme, analytical processing and data integrity were analyzed**



Sample BOM

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Appendix D: Sample BOM

Component Information						Material Information			Substance Information				
Description	Part Number	Qty	Unit	Supplier Name	Mass	Unit	Material	Amount (%)	Mass (g)	Substance	CAS #	Amount (%)	Mass (g)
Housing	1	1	EA	Supplier X	100.000	G	AL ALLOY 303	100	100	MANGANESE	7439-98-5	0.1	0.1
										MAGNESIUM	7439-95-4	2.6	2.6
										SILICON	7440-21-3	0.25	0.25
										COPPER	7440-50-8	0.1	0.1
										CHROMIUM(III) COMPOUNDS	16065-83-1	0.15	0.15
										ALUMINIUM (METAL)	7429-90-5	96.3	96.3
										IRON	7439-89-6	0.4	0.4
										ZINC (METAL)	7440-66-6	0.1	0.1
Screw	2	4	EA	Supplier A	0.788	G	SILICA	0.0001	7.88E-07	SILICIC ACID, SODIUM SALT	1344-09-8	100	7.88E-07
										TRIVALENT CHROMIUM	10060-12-5	100	7.88E-07
										STEEL	7439-98-5	94.1498	0.740017
										MANGANESE	7440-50-8	0.54	0.0039961
										COPPER	7439-89-6	89.23	0.7343193
										IRON	7440-66-6	0.23	0.001702
Connector	3	1	EA	Supplier B	12.300	G	PPA	37.32	4.59036	ZINC	7440-66-6	100	0.045981
										PPA	-	100	11.880714
										TIN/LEAD	7440-31-5	0.68	0.0756
										LEAD	7439-92-1	10	0.0084
										BRASS	7440-66-6	40	4.92
										ZINC	7440-31-5	33.0618	0.1452358
TIN	7440-31-5	0.0053	2.328E-05										

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NEMI Questionnaire Matrix

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Appendix E: NEMI Questionnaire Matrix

Material Declarations Pilot

Pilot Evaluation Matrix (Data Exchange S

Revision Draft

	Ease of Use		Scalability		Reporting Scher		Analytical Process		Data integrity		Results	
	Supplier Interface	Tier Interfac	Supplie Interfac	Tier Interfac	Supplie Interfac	Tier Interfac	Supplie Interfac	Tier Interfac	Supplie Interfac	Tier Interfac	Supplie Interfac	Tier Interfac
A												
B												
C												

Ease of Use: (Ranking ?)

- 1 Time to Complete (*Note* Assumes composition data if available to complete)
- 2 Help Text
- 3 Tool Familiarity
- 4 Tracking & Quick Status Capability

Scalability: (Y/N)

- 1 Adoptable across company? (Y/N)
- 2 Support small to large scale?

Reporting Scher (Y/N)

- 1 Can support legislative requirements (*Note* Assume ELV Legislation as Basis)
- 2 Meets minimal collection criteria = part to material to substance scheme

Analytical: (Y/N)

- 1 Support "homogenous" identification (*Note* example plating/terminal finish)
- 2 Support concentration level identification based on component and homogenous level

Data Integrity (Y/N)

- 1 Drives Data accuracy
- 2 Supports Audit Trail Capabilities
- 3 Security

Results (Y/N)

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Connect with and Strengthen your Supply Chain



Motorola Pilot of Synapsis Technology EMARS™

- **Data collection & exchange software:**
 - **Compliance Connect™ Excel spreadsheet (Centor Software)**
 - **International Material Data System (IMDS) (EDS web-based tool used by the automotive industry)**
- **Data analysis and reporting**
 - **Synapsis Technology Environmental Materials Aggregation and Reporting Systems (EMARS)**
- **Data collection and exchange**
 - **Motorola invited 6 suppliers to participate in the pilot.**
 - **Each supplier was asked to supply material declaration data based on the NEMI pilot BOM, using the Centor Compliance Connect™ or IMDS web-based tool, as specified by Motorola.**
 - **Suppliers were asked to complete an evaluation questionnaire**



Motorola Pilot of Synapsis Technology EMARSTM

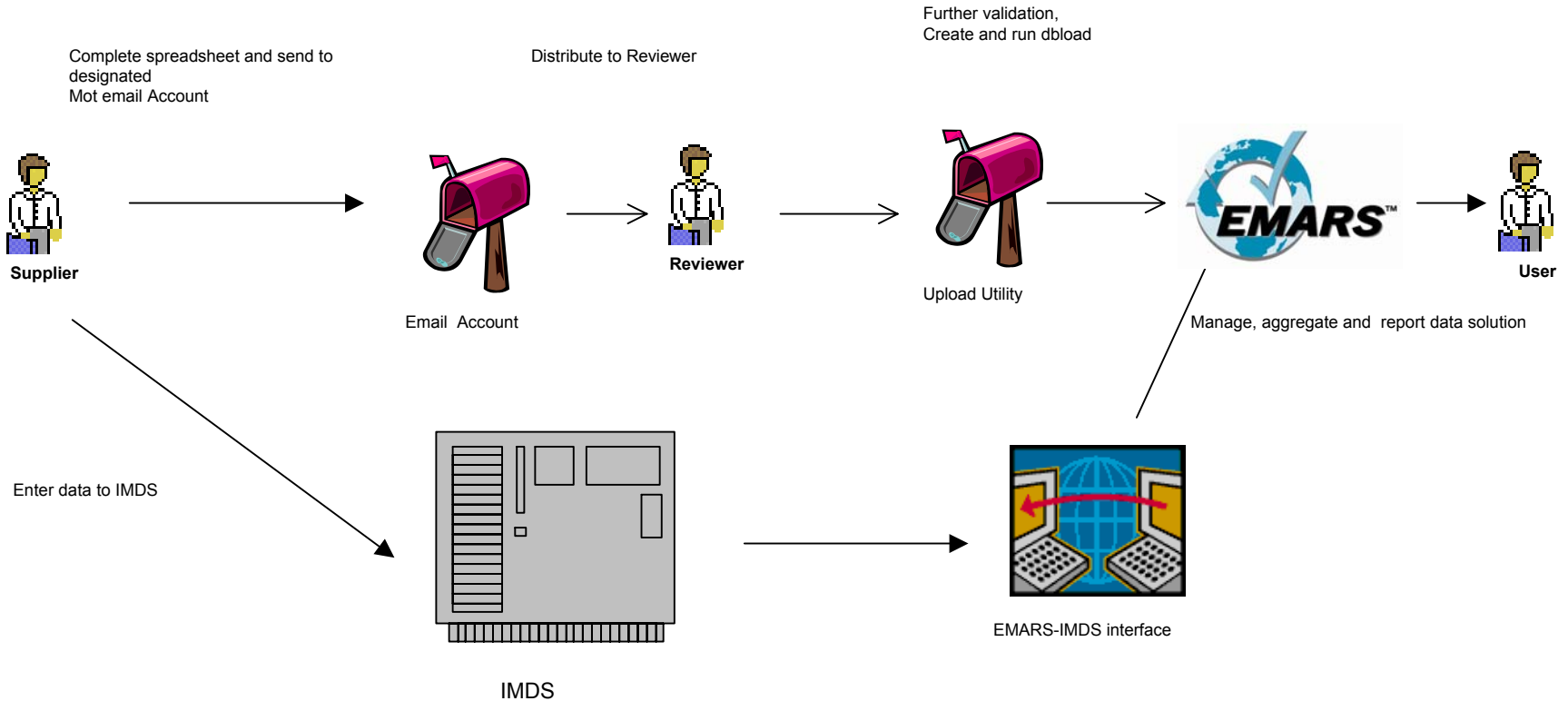
- **Supplier D: Japanese-based passive manufacturer, 2003 revenues of approximately US \$10 billion**
- **Supplier F: US-based capacitor manufacturer with revenues in excess of US \$400 million**
- **Supplier H: US-based semiconductor manufacturer, 2003 revenues of approximately US \$2 billion**
- **Supplier X: US-based mechanical component manufacturer**
- **Supplier Z: Taiwanese-based privately held PCB manufacturer**

Suppliers in the pilot indicated a general satisfaction with the Compliance Connect tool, but cited upgrade compatibility as an issue. The supplier utilizing IMDS to disclose material content indicated issues with system response time and preferred the use of Compliance Connect.



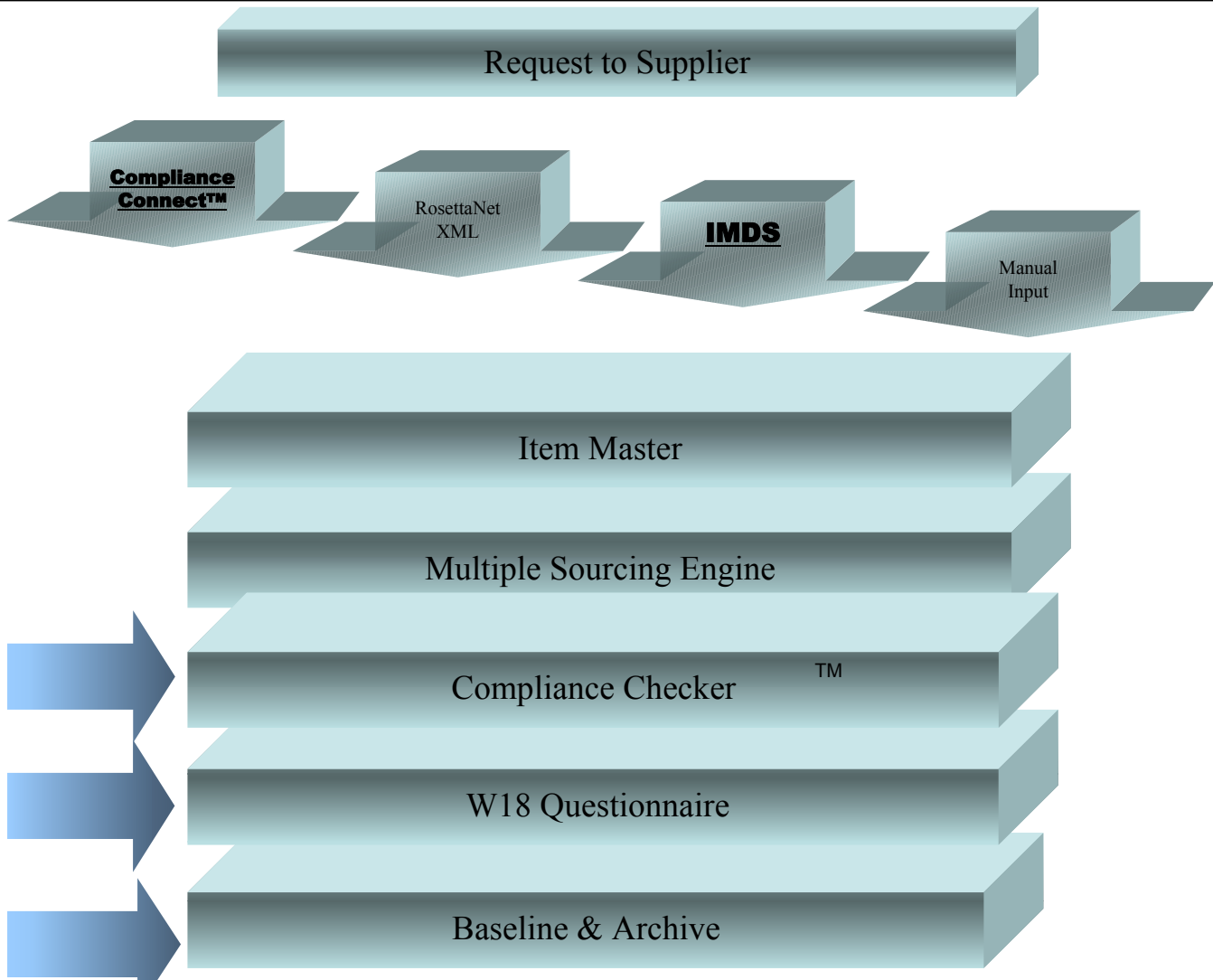
Motorola Pilot of Synapsis Technology EMARS™

Figure 1. Part Compliance - Data Collection Flow





Motorola Pilot of Synapsis Technology EMARSTM

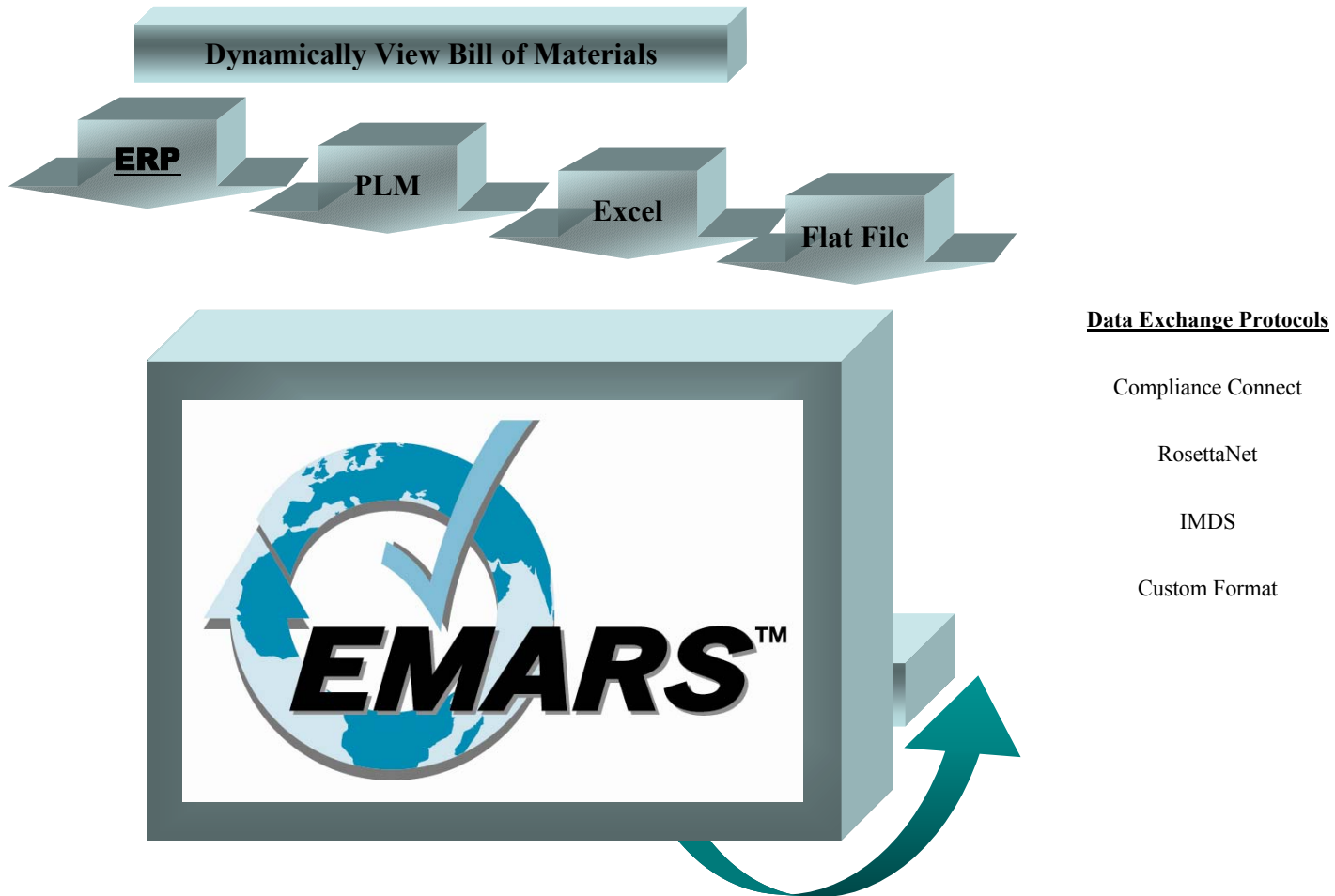


Connect with and Strengthen your Supply Chain



Motorola Pilot of Synapsis Technology EMARS™

Figure 3. Product Aggregation and Reporting - Process Flow



Connect with and Strengthen your Supply Chain



Motorola EMARS™ Pilot Results

- **EMARS™ could perform aggregation at any level**
- **EMARS™ was configured to comply with Motorola's internal, customer and regulatory requirements**
- **EMARS™ was a flexible tool that allowed Motorola to configure it for JIG Annex A, B or any customer standard**
- **EMARS™ was fully integrated into Motorola's i2 eXplore and BOM Management Systems**
- **Product aggregation reports were validated by Motorola scientists**
- **The NEMI Pilot for EMARS™ was a success**
Connect with and Strengthen your Supply Chain



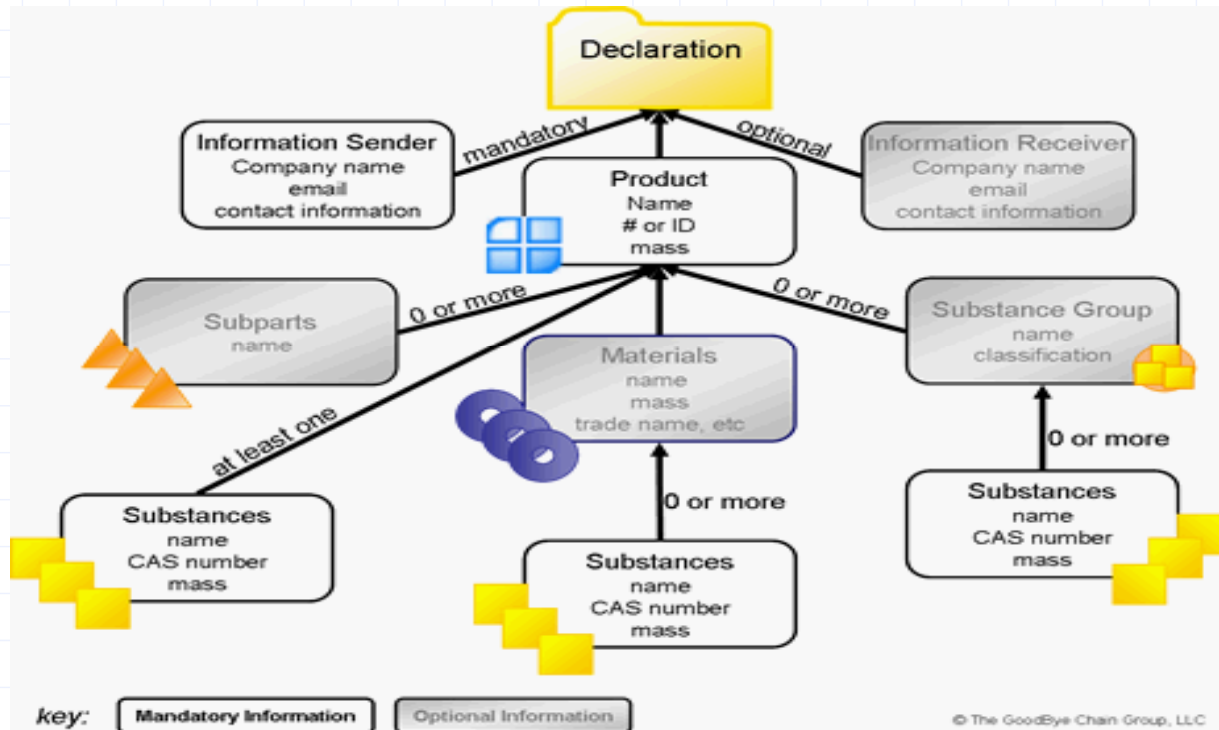
Eastman Kodak Company Pilot of the Goodbye Chain Material Declaration Wizard

- **Data collection & exchange**
 - **The Goodbye Chain Material Declaration Wizard**
- **Data analysis & reporting**
 - **The Goodbye Chain Material Declaration Wizard**



Eastman Kodak Company Pilot of the Goodbye Chain Material Declaration Wizard

Figure 1. Mandatory and Optional Data Fields of JIG*

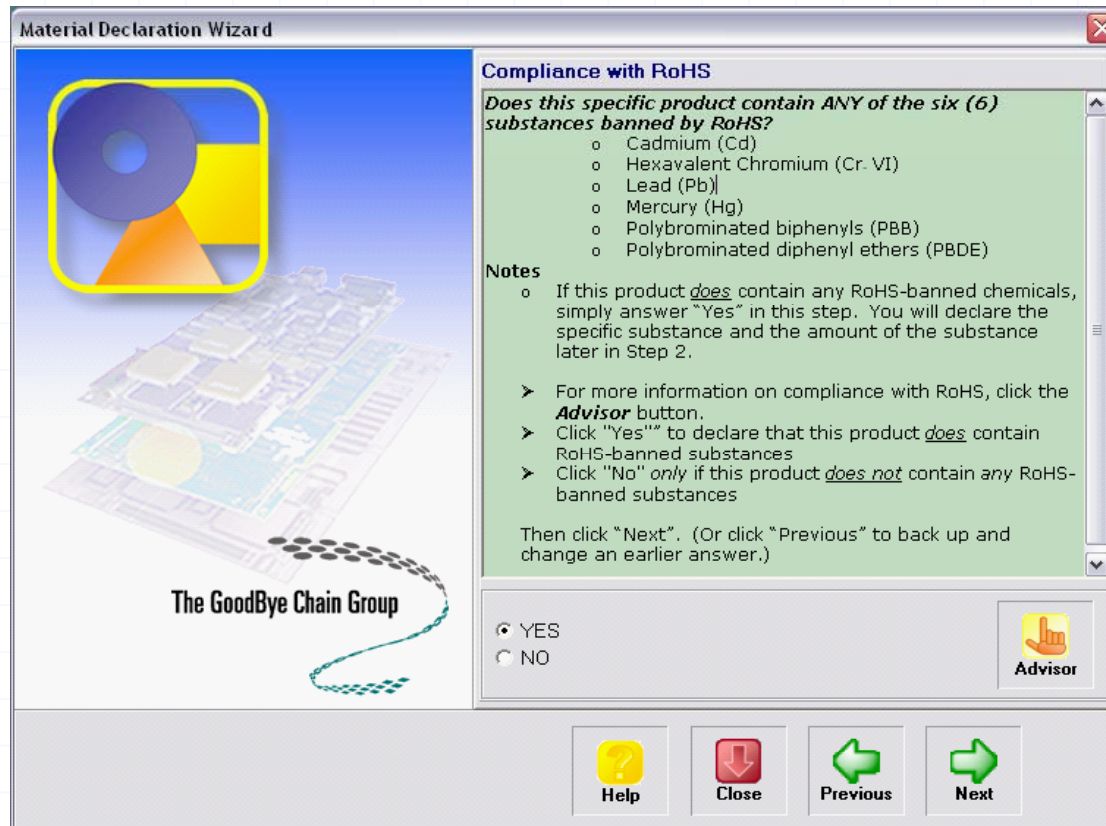


*Joint Industry Guide



Eastman Kodak Company Pilot of the Goodbye Chain Material Declaration Wizard

Figure 2. Trigger for Regulatory Compliance





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Figure 3. Decision Tree for Product Composition

The screenshot displays the 'Product Material Declaration' software interface. The main window is divided into several sections:

- Product Structure:** A tree view showing the composition of a 'Tantalum Capacitor'. The root node is 'Tantalum Capacitor', which branches into 'Alloy 42' and 'Manganese Dioxide'. 'Alloy 42' further branches into various materials: Aluminium (Metal), Carbon, Chromium, Cobalt, Iron, Manganese, Nickel, Phosphorous, Silicon, and Sulphur. 'Manganese Dioxide' branches into 'Manganese Dioxide'. 'Moulding Compound' branches into 'Antimony - Dioxide', 'Cristobalite', 'Phenol, Polymer With Formaldet', and 'Silica, Vitreous'.
- Product information:** A form with the following fields:
 - Prod. Name: Tantalum Capacitor
 - Customer Name: ABC Corp
 - Supplier Name: Supplier D
 - Customer Prod. #: ABC_16
 - Supplier Prod. #: Supplier D_5
 - Total Mass: 0.122000000000 g
 - Quantity: 5
 - Location: (empty)
 - Rev. Level: (empty)
 - Rev. Date: 3/ 2/2004
 - Product Note: (empty)
- Declaration information:** A form with the following fields:
 - Author: Bob Brown
 - Date: 02-Mar-2004
 - Note: Component specified in NEMI BOM_01

At the bottom of the window, there are several buttons and icons:

- Product, Material, Radioactivity (icons)
- Subpart, Substance (icons)
- Advisor (hand icon)
- Add Subpart, Add Material, Add Substance (buttons)
- Help, Close, Calc PPM, Edit Product (buttons)



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Figure 4. Calculation of Substance Mass in ppm. Stop-Light colors indicate compliance/non-compliance

Substance Group	Threshold Level	Calculated PPM	List	
Arsenic/Arsenic Compounds	1000	14.52	B	✓
Bismuth/ Bismuth Compounds	1000	45.38	B	✓
Copper/Copper Compounds	1000	14.52	B	✓
Nickel/Nickel Compounds	1000	56695.90	B	✗
Silver/Silver Compounds	1000	19811.48	B	✗
Hexavalent Chromium/Hexavalent Chr...	1000	329.59	A	✓
Lead/Lead Compounds	1000	1735.25	A	✗

Buttons: Help, Close



Eastman Kodak Company Pilot of the Goodbye Chain Material Declaration Wizard

Figure 5. Summary of Products for Material Declaration

Product Library						Product Name	Customer Prod. #.	Supplier Prod. #	Customer	Supplier	Certified
A	B	C	R	S							
●	●	+	●	○	Housing	ABC_10	Supplier X_1	ABC Corp	Supplier X	NO	
●	○	+	●	●	Screw	ABC_11	Supplier A_2	ABC Corp	Supplier A	NO	
●	○	+	○	○	Connector	ABC_12	Supplier B_3	ABC Corp	Supplier B	NO	
●	○	+	○	○	Connector 2	ABC_13	Supplier C_3	ABC Corp.	Supplier C	NO	
○	○	+	○	○	Resistor	ABC_14	Supplier D_4	ABC Corp.	Supplier D	NO	
○	○	+	○	●	Resistor 2	ABC_15	Supplier E_4	ABC Corp	Supplier E	NO	
○	○	+	○	○	Tantalum Capacitor	ABC_16	Supplier D_5	ABC Corp	Supplier D	NO	
●	○	+	○	○	Capacitor	ABC_17	Supplier F_6	ABC Corp	Supplier F	NO	
●	○	+	○	○	Crystal	ABC_18	Supplier G_7	ABC Corp	Supplier G	NO	
○	○	+	○	○	IC1	ABC_19	Supplier H_8	ABC Corp	Supplier H	NO	
○	○	+	○	○	IC2	ABC_20	Supplier G_9	ABC Corp	Supplier G	NO	
○	○	+	○	○	IC3	ABC_21	Supplier H_10	ABC Corp	Supplier H	NO	
●	○	+	○	○	Filter	ABC_22	Supplier V_11	ABC Corp	Supplier V	NO	
○	●	+	○	○	Solder	ABC_22	Supplier Y_12	ABC Corp	Supplier Y	NO	
○	○	+	○	●	Printed Circuit Board	ABC_23	Supplier Z_13	ABC Corp	Supplier Z	YES	

A JIG "A List" Compliance B JIG "B List" Compliance C "C List" Applies R RoHS Compliance S Pb-Free Assembly Tested Certified Product	MDF Available Actions: Certify Delete Export Import Help Close Update Clone Sort Reports
--	---

non-compliant
 compliant
 C substance present
 C substance not present



Eastman Kodak Company Pilot of the Goodbye Chain Material Declaration Wizard

Figure 6. Draft JIG's List A of Regulated Substances

Material Declaration Guidelines
[Close] [Maximize]

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- 1 Welcome
- 1 Getting Started - FAQs
- 1 Use of Guide
- 1 The ADVISOR
 - 2 Why Declare?
 - 2 Terms and Definitions
 - 2 Declaration Requirements
 - 2 Chemical Legislation
 - 2 EEE Legislation
- 2 RoHS
- 2 WEEE
- 2 Lead-Free
- 2 Joint Industry Guide
 - 2 **Level A Substances**
 - 2 Level B Substances
 - 2 Level C - (optional)
 - 2 Sample Form
- 2 Common Materials with
- 2 How To Use MDW
- 2 Credits
- 2 Good Bye Chain Group
- 2 Disclaimer

Level A Substances and Materials

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For Level "A" list substances and materials, the threshold levels are set by the law that bans or restricts their use. Therefore, assessment as to whether the threshold level has been met must be based on the relevant legal requirements. If international law establishes a new threshold for ban or restriction purposes, this threshold will be revised accordingly. For laws that allow the presence of certain materials or substances in amounts lower than a certain "part per million" (ppm) threshold, companies should use the "ppm methodology" that is established by that law in order to determine whether disclosure is necessary. Reporting below the threshold is allowed, but not required.

"Intentionally Added" means the deliberate use in the formulation of a product or subpart where its continued presence is desired in the final product or subpart to provide a specific characteristic, appearance, or quality.

If a substance or material is intentionally added, then it needs to be reported regardless of its content level. If the substance or material is otherwise present, then its threshold level applies.

Where metals are listed in Annex A, they require reporting of the metal in the metal alloys, e.g. Lead/Lead Compounds also includes reporting of the Lead content in the Lead alloy.

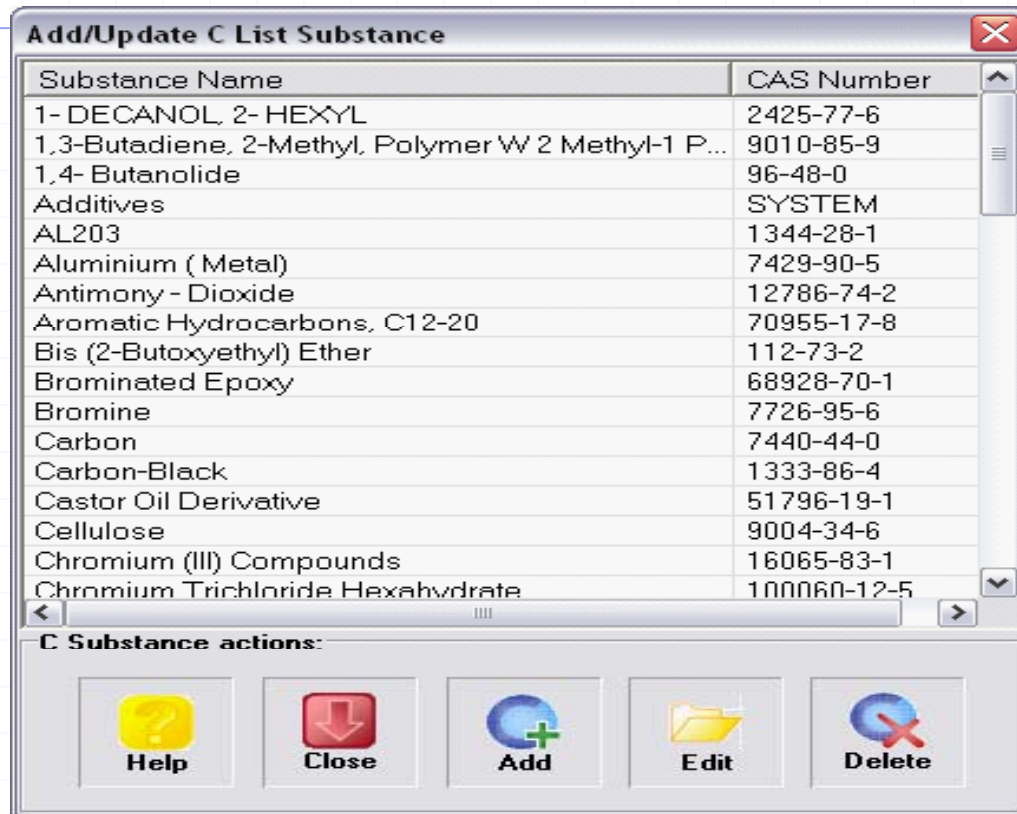
Note: Substances and materials are listed by group. However, in some cases where only a subset are regulated, please follow links for details.

Material/Substance	Threshold level
Asbestos	Intentionally added
Azo colorants	Intentionally added
Cadmium /Cadmium Compounds	75 ppm or Intentionally added
Hexavalent Chromium	1000 ppm or Intentionally added
Hexavalent Chromium Compounds	1000 ppm or Intentionally added
Lead/Lead Compounds	1000 ppm or Intentionally added
Mercury/Mercury Compounds	1000 ppm or Intentionally added
Ozone Depleting Substances (CFCs, HCFCs, HBFCs, carbon tetrachloride, etc.)	1000 ppm or Intentionally added
Class I:	Intentionally added



Eastman Kodak Company Pilot of the Goodbye Chain Material Declaration Wizard

Figure 7. Optional Category of "C" List Substances Could Be Augmented by Substance Unique to Customer





Eastman Kodak Company Pilot of the Goodbye Chain Material Declaration Wizard

Figure 8. Product Certification Form




Product Certification

I certify that I am authorized to declare this Material Declaration Form on behalf of my company; that this product was produced by my company; that if this product was produced using parts from another company that I am responsible for the truth and accuracy of all declaration and disclosure information specific to those parts in addition to my own parts; that all substance absence or presence declarations are true and accurate; that all parts per million threshold declarations are true and accurate; that all intentionally added substance declarations are true and accurate; that all lead free assembly declarations are true and accurate; that all other information represented in this Material Declaration is true and accurate; that all statements made on information and belief are believed to be true; and further that these declarations are made with the knowledge that willful false statements are punishable by fine or imprisonment, or both; and that such willful false statements may jeopardize the validity of this Material Declaration or any and all contractual agreements between my company and the Material Declaration recipient company.

Product:

Certified By:

Date:

 Help  Close  Certify



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Figure 9. Unique Sender and Receiver Information for Product Declaration

The screenshot shows a software window titled "View/Update Sender/Receiver data" with a close button (X) in the top right corner. The window is divided into two columns: "Information Sender" and "Information Receiver". Each column contains a series of text input fields for various data points. At the bottom of the window, there are three buttons: "Help" (with a question mark icon), "Close" (with a red arrow icon), and "Save" (with a folder icon).

Field	Information Sender	Information Receiver
DUNS	DUNS	DUNS
Company	Supplier Corp	ABC Corp
Division	Division	Division
Contact	Bob Brown	Tom White
E-MAIL	bbrown@suppliercorp.com	twhite@abccorp.com
Street1	Street1	Street1
Street2	Street2	Street2
City	City	City
State	State	State
Country	Country	Country
Zip Code	Zip Code	Zip Code
Phone	Phone	Phone



Eastman Kodak Company Pilot of the Goodbye Chain Material Declaration Wizard

- **MDW was easy to use – no training required**
- **MDW was scalable**
- **Parts per million calculations were done automatically from input mass (g) data**
- **MDW indicated compliance / non-compliance status with green / red lights**
- **MDW showed compliance with JIG A and B lists, and optional C lists**
- **The NEMI Pilot for MDW was a success**



Jabil / Compliance Connect™ / Compliance X-sight™ Pilot Results

Data collection & exchange software: Compliance Connect™

Jabil took the data from the NEMI pilot BOM and entered it into the data collection spreadsheet. A Jabil user implementing the pilot had not used the data collection tool before. A limited group of suppliers was surveyed with the questions in the NEMI pilot questionnaire.

Data Analysis & Reporting software: Compliance X-Sight™.

- **Pilot BOM was loaded into Jabil's ERP system and was exported into Centor's Compliance X-Sight tool. Compliance X-Sight was used to analyze the data and generate reports. The tool reported results with 100% accuracy.**



Jabil Supplier Survey Responses

- **75% of suppliers found the tool “somewhat easy” - 25% felt it was difficult to use**
- **Issues raised:**
 - **Initially cumbersome (complexity), but became easier with use**
 - **Revision levels**
 - **Breakdown of part tree,**
 - **Intelligent spreadsheet imposing discipline**
 - **Supplier code consistency (Jabil issue)**
 - **Suppliers reported a range of five minutes to one hour for completing the spreadsheet.**
- **Suggestions:** **Umbrella specs, Free training, Limit data collection to banned substances only**



Jabil Pilot Results

- ~~Data integrity is ensured by embedded intelligence (supplier compliant) and data are certified by the supplier or not accepted by the tool.~~
- Suppliers reported requiring more than one hour to complete the survey; however, Jabil completed survey in less an hour
- The overall pilot was found to be easy
- No major issues were raised. Minor issues were resolved
- Suggestions for improvement include synergy with Jabil requirements for efficiency and value
- NEMI Pilot for Compliance Connect and X-Sight was a success



Phase 1 Conclusions

- **All 3 Materials Declaration tools piloted were recommended for reporting to the JIG Annex A, and are capable of reporting the Annex B list of substances and substance amounts**
 - **Synapsis Technology's EMARS™ (Environmental Materials Aggregation and Reporting System)**
 - **Centor's Compliance Connect™ and Compliance X-Sight™**
 - **The Goodbye Chain Group's Materials Declaration Wizard**



Recommendations

- **It was recommended that the standard drafting committee for the Joint Industry Guide consider:**
 - **A realistic list of substances to be reported on**
 - **Threshold values for those substances**
 - **Compliance criteria**
- **Launched a Phase 2 Project in May 2004 to:**
 - **Recommend an “extensible”, industry standard Materials Declaration Collection and Reporting Format and**
 - **Industry Standard Materials Declaration Process**
 - **Aligned with the Joint Industry Guide, requirements of RoHS, WEEE and industry best practices**