



White Paper

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**Best Practices
for REACH Compliance Management
for Electronics OEMs**

The EU regulation has implications for manufacturers of all sizes.
Building a foundation of accurate and thorough data is key.

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The REACH Era

The regulation referred to as REACH (**R**egistration, **E**valuation and **A**uthorization of **C**hemicals), came into effect in European Union Member States in June of 2007. The intent of REACH is to regulate chemicals that can cause cancer and other diseases.

REACH applies to thousands of chemicals (substances) that are used or present in electrical equipment. REACH also applies to mixtures or solutions of substances (preparations), and end products (articles). Substances of Very High Concern (SVHCs), are the most hazardous and harmful substances and are highly regulated. Products containing SVHCs may not receive authorization if a safer alternative exists.

REACH affects all organizations that export, manufacture, or use chemicals. Early planning and good communications are urgently needed to avoid disruptions in the supply chain. Parts and equipment manufacturers will be affected by unexpected withdrawal of substances from their suppliers due to REACH.

Compliance with REACH will require manufacturers to have more detailed knowledge of the substances they use or are present in their products. The burden of compliance falls not just on large OEMs that export to the EU. Small and medium enterprises (SMEs) also share the burden of compliance, even if they do not directly export to the EU. Large OEMs are responding to REACH by developing compliance standards of their own and asking their suppliers for chemical composition data on products.

Complying with RoHS, which regulated just 6 substances and related compounds, was a difficult enough task. REACH regulates more than 30,000 substances and the SVHC list will grow and change regularly. The task of collecting detailed information about which substances are contained in products will be extensive and ongoing.

The Challenges of REACH Compliance for Electronics OEMs

Data Collection. The biggest challenge for electronics OEMs in managing REACH compliance is to discover the chemical composition of all components and materials used in their products. With full knowledge of the chemicals used, OEMs can create a compliance plan that will work short and long-term. However, collecting chemical substance information from suppliers is a tedious and resource-intensive job. It takes numerous phone calls or emails; suppliers often do not understand aspects of regulations such as SVHCs; and suppliers sometimes demand a rationale for sharing information.

Ask for full-disclosure substance data whenever possible. If the SVHC list changes, for example, you don't have to ask for more data in the future. If full-disclosure data is not available from a supplier, at the very least, try to obtain a non-use SVHC statement or certificate. (Here's a [sample SVHC certificate](#) from one component supplier.) Ideally, suppliers should inform you about their use of SVHC when it exceeds 0.1% in concentration. In reality, it is risky not to pursue this data and to rely only on suppliers to provide notification. (Here's [another example of a REACH](#)

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statement from a component supplier that has used one of the SVHC substances in one of their products but the amount does not go over 0.1%).

Data Validation and Consolidation. The second challenge begins after chemical substance data begins to arrive from suppliers. The data may not be clean and it needs to be validated. Here are some common problems: (1) the chemical substance name does not match the CAS number; (2) the CAS number is incomplete or missing; (3) two different substances use the same CAS number; (4) different suppliers refer to identical substances with different names and different CAS numbers. In Figure 1 below, SiO₂ is correlated to two different CAS numbers. In this case, and in all others where data cleansing and consolidation has not taken place, it is not possible generate an accurate rollup of the total weight of chemicals used in the product. Resolving these issues is necessary before conducting substance analysis for REACH compliance.

<u>Breakdown of all Materials</u>	(All materials in the part)			
	<i>Materials</i>	<i>% Weight</i>	<i>PPM</i>	<i>Where Used</i>
Al2O3	98.97	989790	substrate	12036-10-1
SiO ₂	2.155	21550	substrate	7440-21-3
MgO	0.575	5750	substrate	1313-13-9
Ag	3.638	36380	inner electrode top	7440-22-4
Pd	0.099	990	inner electrode top	7440-05-3
PbO	0.08	800	inner electrode top	1309-60-0
B2O3	0.04	400	inner electrode top	1303-86-2
SiO ₂	0.08	800	inner electrode top	7631-86-9
Ni	0.338	3380	inner electrode side	7440-02-0
Cr	0.338	3380	inner electrode side	7440-47-3
RuO ₂	0.992	9920	Resistive Film	12036-10-1
PbO	1.006	10060	Resistive Film	1309-60-0
B2O3	0.262	2620	Resistive Film	1303-86-2
SiO ₂	0.569	5690	Resistive Film	7631-86-9
PbO	0.696	6960	inner protective coat	1309-60-0
B2O3	0.277	2770	inner protective coat	1303-86-2
SiO ₂	0.419	4190	inner protective coat	7631-86-9
Epoxy Resin	1.547	15470	Outer protective coat	129915-35-1
SiO ₂	0.184	1840	Outer protective coat	7631-86-9
CuO	0.231	2310	Outer protective coat	1317-38-0
Cr2O3	0.472	4720	Outer protective coat	1308-38-9
MnO ₂	0.079	790	Outer protective coat	1313-13-9
Ni	8.85	88500	Middle termination	7440-02-0
Sn	6.926	69260	outer termination	7440-31-5
Others	1.147	11470	others (all locations)	---

Figure 1: Correction of CAS number for SiO₂ is necessary

Establishment of Chemical Substance Database. The third challenge is to establish an enterprise-level chemical substance database covering all components used to build the products. A software system is necessary to manage the enterprise-level chemical substance database. The system needs to be able to roll up substance data from homogeneous materials. In order to help identify problem areas, the software system should be able to calculate substance data at the component, assembly, and product level. The system will also enable proper reporting on particular substances (such as SVHC or CMR substances) at the product level or even across different products.

A chemical substance database covering potentially thousands of components is complex and far beyond the limits of a spreadsheet application like Excel. Moreover,

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entering the data by hand is impractical and will introduce errors. To illustrate the problem, see chemical substance data for two components: [sample A](#) and [sample B](#). Requesting that suppliers send chemical substance data in a common format that your software is able to import directly is also not feasible in reality. Finding a proper way of entering the chemical substance data to the software system is a challenge.

Limited resources. Most electronics OEMs have no one devoted to or specializing in chemical management. Most likely, the task of REACH compliance will go either to component engineering or the quality group. Designers of products have little need to know the chemical substances used in the components, though they do need to know whether the components they select are REACH-compliant. With limited resources and budget, most companies can only afford to have a few people be responsible for this task and cannot afford to spend several hundreds of thousands of dollars on REACH compliance modules available with ERP or PLM upgrades. Finding a way of implementing REACH compliance management in a limited budget with limited resources is another challenge that most companies have to face.

Best Practices of Compliance Management in REACH

Scrub your BOMs. Most BOMs are dirty. Dirty BOMs contain inaccurate manufacturer part names and part numbers. Before calling suppliers for chemical substance data, it's best to start by cleaning up the dirty BOMs stored in the ERP or PLM. You may have done this several years ago while requesting RoHS data from suppliers. If not, now is the time to scrub your BOMs by validating the manufacturer names, manufacturer part numbers and part description on all components in the BOMs. It will save a tremendous amount of time in getting data from your suppliers.

Collect full-disclosure chemical substance info from suppliers if possible. In order to be REACH-compliant, you need to know the chemical substance composition of the components in your products. This means collecting full-disclosure chemical substance data from your suppliers. It is highly recommended, if financially viable, to outsource the data collection to a 3rd-party solution provider. By tapping into the chemical substance database established by the 3rd-party solution provider, you may find that data collection is actually cheaper, faster, and more accurate than doing it in-house. Outsourcing data collection enables your component or quality engineers to focus on their core competencies of completing the product with quality, instead of dealing with mismatched part numbers, CAS numbers, substance names, etc.

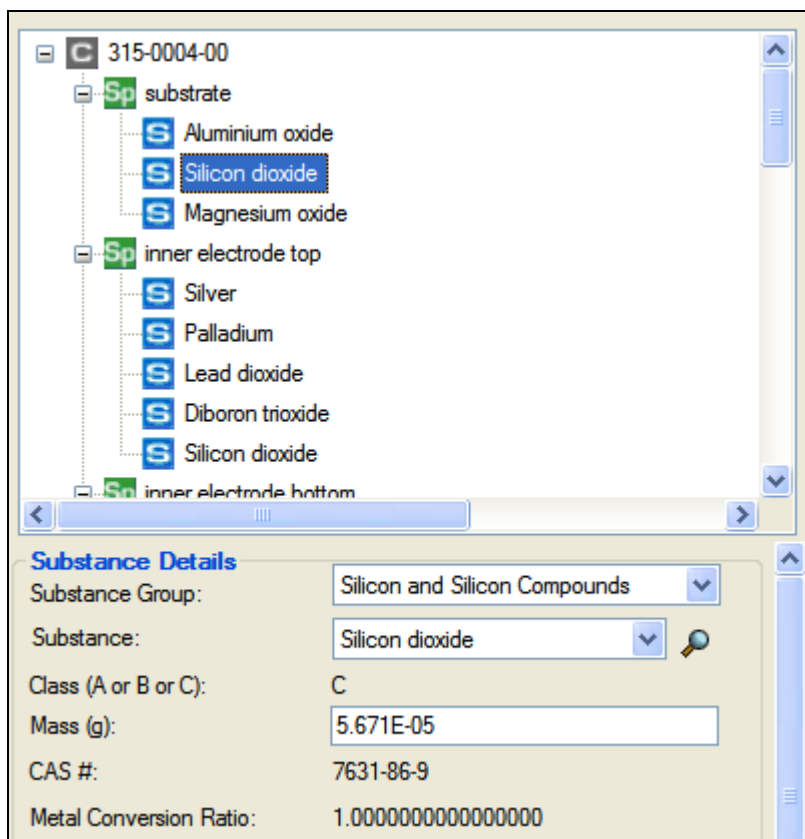


Figure 2: Import of full-disclosure substance data of a component after data validation

Select the proper software tool to help manage REACH compliance. Once you start collecting chemical substance data from suppliers, a software tool is necessary to help manage collection activities, establish the internal chemical substance database, and analyze the substances used in your products. The tool needs to tell you what has been collected and what has not, and should be able to report the aggregated weight of a substance in a product based on the projected annual shipment to the EU or customers in another region. The tool should also report on any SVHC substance contained in components used in your product in order to communicate with your suppliers for replacements and to alert your customers to proper usage scenarios. You may need to notify the ECHA on the use of SVHC substances in your products if they account for more than 0.1% of the product weight when more than 1 tonne is shipped to the EU per year. The tool should also be capable of scanning all components for substances in the categories of CMR (Carcinogenic, Mutagenic or Reprotoxic), PBT (Persistent, Bioaccumulative and Toxic) or vPvB (very persistent, very bioaccumulative) for possible violation of SVHCs in the future.

Enter chemical substance data in the software tool to establish an internal chemical substance database. While collecting and validating chemical substance data from the components used in your products, you need to establish an internal chemical substance database by entering the substance data to the software tool. Be aware of these issues:

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Data Format. Suppliers can provide chemical substance data in various formats, including pdf, Excel, html, XML and IPC-1752 forms. These formats need to be consolidated into one standard format in order to import them to the software tool. If you have outsourced the data collection job to a 3rd-party data provider, ask them to provide a common format that can be imported to the software tool.

Consolidated Substance Master. Entering substance data into the software tool can reveal several potentially difficult issues:

1. Some substances have a different CAS number but have the same substance name because they actually are the same substance. See Figure 3, an illustration from the SVHC Candidate List. CAS number 7789-12-0 and CAS number 10588-01-9 are both Sodium Dichromate. When a part contains substance 7789-12-0 and substance 10588-01-9, the software tool will need to be able to recognize that these two are actually the same and aggregate them properly.

Substance name	CAS number	EC number	Basis for Identification as a SVHC
Diarsenic pentaoxide	1303-28-2	215-116-9	Carcinogen, cat. 1
Diarsenic trioxide	1327-53-3	215-481-4	Carcinogen, cat. 1
Sodium dichromate	7789-12-0 10588-01-9	234-190-3	Carcinogen, cat. 2; Mutagen, cat. 2 Toxic for reproduction, cat. 2

Figure 3: Substance aliasing between 7789-12-0 and 10588-01-9

2. Some substances have different CAS numbers and different substance names, but are in the same group of restricted substances. See Figure 4 below, again from the SVHC Candidate List. Note that HBCDD could have 2 different CAS numbers: 25637-99-4 or 3194-55-6, an alias CAS number. HBCDD could also have 3 isomeric series: alpha-HBCDD (134237-51-7), beta-HBCDD (134237-50-6), and gamma-HBCDD (134237-52-8). When parts contain any of these substances, the software tool will need to be able to recognize that these actually belong to the same group and aggregate them properly.

Hexabromocyclododecane (HBCDD) and all major diastereoisomers identified (α – HBCDD, β -HBCDD, γ -HBCDD)	25637-99-4 and 3194-55-6 (134237-51-7, 134237-50-6, 134237-52-8)	247-148-4 and 221-695-9	Persistent, bioaccumulative and toxic
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Figure 4: Substance grouping of 5 CAS numbers

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3. The software tool should maintain a consolidated substance master that covers all alias substances provided by suppliers and all isomeric series of substances. In reality, it is almost impossible for any software tool to cover all possible substances with their aliases and isomeric relatives. A good way to solve this issue is to make sure the software tool has a substance master that covers almost all substances provided by suppliers and can handle substance aliases and isomeric series. Most important, the tool should receive updates whenever a new substance provided by the supplier is not covered in the substance master. If you have outsourced the data to a 3rd-party data solution provider, make sure they will work with the software vendor so that both will maintain the same substance master and both will update their substance master whenever a new substance is identified.
4. Almost all software vendors claim to be able to import substance data in IPC-1752 format, but this format has limitations. IPC-1752's substance master is based on JIG specifications, so only about 300 substances are covered. Substances beyond JIG will be tagged as either Supplier Specific or Requester Specific. You will almost certainly see suppliers submit substance data and tag it Supplier Specific. If you are working with a data vendor to perform data collection, make sure to ask that they consolidate the substances so that all Supplier Specific substances or Requester Specific substances be grouped so that they can be aggregated in the software.
5. One recommendation is to find a 3rd-party solution provider that both collects data and provides the software tool. This is the preferred solution because the substance master for both the data service and the software tool are the same and synched for updates and aliases. This eliminates the issue of consolidated substances and substance maintenance, and reduces management of two vendors (or more) to one.

Make sound decision on change of parts or change of suppliers based on REACH compliance performance. Should you discover that components used in your BOMs contain certain regulated substances (from SVHC, CMR, PBT or vPvB), communicate with your suppliers for replacements. If the supplier fails to provide a plan for replacement, you may need to consider changing the suppliers. Based on the analysis from the tool, you should be able to make such decision quickly in order to avoid any disruption in businesses.

GreenSoft's REACH Compliance Solution

GreenSoft has been providing component data to electronic manufacturers since 2002, and has established a component database of more than 8 million part numbers from more than 4000 suppliers worldwide. GreenSoft's component database includes component parametric data, lifecycle data, Pb-free manufacturing data, tin-whisker mitigation data, RoHS compliance data and full-disclosure substance data. GreenSoft's Data Management Services assist companies big and small in data collection, data validation and data consolidation and has been the cornerstone of REACH compliance for many companies.

In addition to data management services, GreenSoft also provides a software tool—

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GreenData Manager-REACH—to manage compliance data. GDM-REACH manages the collection of data and documents, conducts substance analysis and performs compliance validation. It is much more affordable than Green modules available with some PLM or ERP systems. And GDM-REACH saves time by enabling the management of all important compliance activities in one convenient package.

GreenSoft is unique in that it offers a solution that integrates data and software. As a data provider, GreenSoft knows the intricacies of importing substance data into software and, for example, has developed methods to avoid mismatches of supplier-specific substances so that you can be certain the data is correct for analysis and reporting. And as a software provider, GreenSoft understands how best to get data into the system efficiently.

- **Data Management Services.** GreenSoft's Data Management Services start by scrubbing your BOMs or cleansing your parts by validating the manufacturer name, manufacturer part number and description, and lifecycle data from the suppliers. GreenSoft contacts your suppliers on your behalf to request all needed information and validates the data provided by the suppliers. GreenSoft then consolidates the data into a format that is easily imported into GreenData Manager-REACH.
- **Data Collection Management.** GDM-REACH manages the data collection activities by scanning the required data fields and reporting the completion status for each component. Required data fields can include compliance documents (such as RoHS certificates) and specific substances. Figure 5 shows the requirements setup page in GDM-REACH. Figure 6 illustrates a completion status report for an Item Master.

Requirements Setup: Step 1 – Select the Required Fields

Part Number Profile Segment :

- Part Series/Part Family
- Corrected Manufacturer Name (Status cannot be edited)
- Corrected Manufacturer Part Number (Status cannot be edited)
- Package
- Category
- Description
- Datasheet (Datasheet Link)
- MSDS Link

Lifecycle Status Segment :

- Lifecycle Status
- End-of-Life Date
- Last-Time-Buy Date

1. Define the required fields from each segment by checking the boxes.

2. Select the optional fields from each segment by clicking the boxes until they are grayed out. It will become part of the fields requested for quote in the RFQ to GreenSoft and it will not impact the Completion status on the selected part.

Requirements Setup: Step 2 – Select the Required Substances

Substance Group Name: Aluminum and Aluminum Compounds

Substance Name: <Not Selected>

Delete Substance/Substance Group - Select the Substance/Substance Group and click Delete

Required Substances

Substance Group Name	Substance Name
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Figure 5: Set up the required data fields, documents and substances for collection

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Item Master List												
● : OK/Passed ● : Not Ready/Failed ● : Invalid Entry/Incomplete ● : Document Expired ● : Passed with Exemption ● : Subpart Info Incomplete ● : Subpart Failed												
IPN	MFG	Part Series	MFG PN	Description	Completion Status	EU RoHS Status	R2 Status	CoC Status	MCD Doc Status	MCD Status	MCD Type	
315-0044-00	Dale/Vishay		CRCW060382R5FKEA	RES,THKFLM,82.5 OH...	●	●	○	●	●	●	Full Disclosure	
315-0052-00	KOA Speer		RK73H1JTTD4021F	RES,THKFLM,4.02 KO...	●	●	○	●	●	●	Full Disclosure	
315-0052-00	ROHM		MCR03F4021E2P	RES,THKFLM,4.02 KO...	●	●	○	●	●	●	Full Disclosure	
315-0059-00	KOA Speer		RK73B1JTTD201J	RES,THKFLM,200 OH...	●	●	○	●	●	●	Full Disclosure	
315-0059-00	Dale/Vishay		CRCW0603200RJNEA	RES,THKFLM,200 OH...	●	●	○	●	●	●	Full Disclosure	
315-0059-00	YAGEO		RC0603JR-07200RL	RES,THKFLM,200 OH...	●	●	○	●	●	●	Full Disclosure	

Figure 6: Completion status report. Also shows collection type of substance data for each component (MCD Type).

- Substance Analysis on Components or Products.** GDM-REACH supports the analysis of one substance or multiple substances on all components or a product. GDM-REACH currently incorporates the substance master of more than 18,000 substances covering almost all hazardous substances that come from suppliers. When substance analysis is done on a product level, GDM-REACH allows you to enter the projected shipping amount and rolls up the substance weight on the product. Figure 7 shows the substance for a product; the analysis can be exported to Excel.

Level	BOM ID/Internal PN	Manufacturer Name	Manufacturer PN	2nd Source	Quantity	UOM	Unit Mass (g)	REACH Declaration Status	Substance Present?	Aggregate (ppm)	Aggregate Mass (g)	Tonnage
0	800-001175-01				20000000	each	5.06515	Yes	Present	18602.281	0.0942234	1.884468
1	1001-150				1	each	4.4851	Yes	Present	16367.922	0.0734118	1.468236
2	0022-10036-02	Venkel	C0603C0G500-220JNP		15	each	0.0047	Yes	Present	4468.085	0.000021	0.0063
2	0022-10036-10	AVX (KYOCERA)	TAJA106K010R		8	each	0.0314	Yes	Present	7324.841	0.00023	0.036800001
2	0022-10036-005	Dallas Semi Maxim	MAX811TEUS+T		10	each	0.00928	Yes	Present	61407.853	0.00057	0.11399995
2	0022-10036-005	ST Microelectronics	STM811TW16F	Y			0.01032	Yes	Present	39914.745	0.000412	0.082399999
2	0022-10036-12	ON	15MB170AT3G		2	each	0.10145	Yes	Present	19640.217	0.0019925	0.0797
2	0022-10036-18	NIC COMPONENTS	NMC0805NPO102J100TRPLPF		4	each	0.00807	Yes	Present	20000.001	0.0001614	0.012912001
2	0022-10036-20	ROHM	RLS4148TE11C		2	each	0.02431	Yes	Present	5183.052	0.000126	0.00504
2	0022-10036-24	SAMTEC INC	SMM-132-02-S-S		2	each	0.64595	Yes	Present	3761.901	0.00243	0.097200004
2	0022-10036-32	SAMTEC INC	TSM-110-01-L-DV-P		2	each	0.91603	Yes	Present	25337.597	0.02321	0.928399973

Figure 7: Substance analysis on a product with projected annual shipment. In this example, more than 1 tonne of "Tin" will be shipped.

- SVHC Reporting on Components or Products.** GDM-REACH supports the reporting of SVHC on all components or products. When the SVHC list changes, GDM-REACH is automatically alerted for upgrades. Figure 8 shows a BOM SVHC report based on the current SVHC list.

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Report Type:	BOM SVHC Report					
Date of Report:	1/28/2009 12:53					
BOM ID:	800-001175-01					
BOM Name:	Control Board B801					
Revision:						
Item No	Substance Name	CAS Number	EC Number	Above Threshold	Concentration (ppm)	Weight (mg)
1	Diarsenic pentoxide (Arsenic pentoxide)	1303-28-2	215-116-9	No	0	0
2	Diarsenic trioxide	1327-53-3	215-481-4	No	0	0
3	4,4'-methylenedianiline	101-77-9	202-974-4	No	0	0
4	1,2,5,6,9,10-	3194-55-6	221-695-9	No	0	0
5	Sodium dichromate	10588-01-9	234-190-3	No	0	0
6	Bis(2-ethylhexyl) phthalate	117-81-7	204-211-0	No	0	0
7	Dibutyl phthalate	84-74-2	201-557-4	No	0	0
8	Alkanes, C10-13, chloro	85535-84-8	287-476-5	No	0	0
9	5-tert-butyl-2,4,6-trinitro-m-	81-15-2	201-329-4	No	0	0
10	Benzyl butyl phthalate	85-68-7	201-622-7	No	0	0
11	bis(tributyltin)oxide,hexabutyl distannoxane	56-35-9	200-268-0	No	0	0
12	Anthracene	120-12-7	204-371-1	No	0	0
13	triethyl arsenate	15606-95-8	427-700-2	No	0	0
14	Cobalt dichloride	7646-79-9	231-589-4	No	0	0
15	lead hydrogen arsenate	7784-40-9	232-064-2	No	0	0

Figure 8: SVHC reporting on the current published SVHC list of 15 items

Conclusion

Compliance with REACH demands thorough and accurate data and an efficient way to analyze and manage the data. Companies throughout the supply chain will be feeling the impact of REACH and need to develop strategies to ensure that disruptions are minimized. These strategies include:

1. Clean the data you already have by scrubbing your BOMs. With GreenSoft's Data Management Services, the first step is always to validate manufacturer names and part numbers because in our experience almost every BOM contains errors.
2. Collect full-disclosure chemical data for all your components if it is available. A third-party solution provider may save you time and money. Remember, as regulations change and the available data increases, data collection is not a one-time task.
3. Find a software tool to manage REACH compliance, including reporting on data collection, and chemical analysis at the component, subassembly, and product level. GreenSoft provides a unique and powerful solution that combines data collection with a software tool.
4. Be rigorous in finding replacements for problem components.

Applying these strategies will help prevent product delays, redesigns, and supply chain disruptions.

Larry Yen is president and CEO of GreenSoft Technology, Inc., a data services provider and developer of software solutions for environmental compliance regulations such as RoHS and REACH. GreenSoft's unique value proposition of providing both data services and compliance management software has made GreenSoft the solution provider of choice for many electronic manufacturers.