

Environmental compliance

SIEMENS

White Paper

Designing and manufacturing products to comply with international ELV, RoHS, REACH and WEEE guidelines

The Teamcenter® software solution for environmental compliance allows automakers and manufacturers of electrical and electronic equipment to develop products and validate their compliance in accordance with multiple environmental guidelines established by U.S., European Union and Asian governments. Companies that leverage compliance as an integral element in their lifecycle processes (as opposed to treating compliance only as an event) gain competitive advantage by getting their products to market faster and more cost effectively.

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Executive summary

On February 13, 2003, two European Union directives went into effect. The Restriction on the Use of Hazardous Substance (RoHS) directive limits the use of six hazardous substances in electrical and electronic products, while the Waste from Electrical and Electronic Equipment (WEEE) directive deals with the best practices for treating, recovering and recycling product waste. By August 13, 2005, manufacturers were required to respond by implementing a first round of compliance-related activities. On November 3, 2003, the European Union's End-of-Life Vehicles (ELV) regulation also went into effect – providing guidelines for the re-use, recycling and disposal of cars, vans and specific types of three-wheel vehicles. This was followed in 2007 with the Registration, Evaluation and Authorization of Chemicals (REACH) policy which was designed to replace more than 40 existing directives with one overarching regulation. REACH consists of 1,000 pages of legal text and technical annexes and has therefore been described as one of the most complex texts in the history of the EU. This trend is not limited to Europe. Also in 2007, phase one of what is dubbed China RoHS went into effect requiring all companies to produce a substance disclosure report and include it in the product literature indicating the presence or absence of any of the six hazardous substances. It is estimated that most of the world's largest economies are actively working on similar legislation.

With these compliance-related requirements rapidly gaining ground, it seems safe to say that developing environmentally compliant products is a must for any company that competes in today's global electronics marketplace. In practical terms, this imperative translates into a requirement that product makers capture and report on the material content of their product offerings. In essence, this requirement arises from the need for product makers to verify that their products are free of hazardous substances and are comprised of components and materials that are able to be widely recycled.

To address these overall compliance objectives while enabling product makers to specifically comply with the REACH, ELV, WEEE and RoHS directives, Siemens PLM Software has integrated Teamcenter – the de facto standard for product lifecycle management (PLM) deployments – with EMARS, Synapsis Technology's Environmental Material Aggregation and Reporting System. The result is a complete solution for the end-to-end collection, management and reporting of environmental compliance and material content information.

This Teamcenter solution enables product developers to easily capture detailed material and substance data that pertains to each of the components provided by the product's various suppliers. This data is captured in the form of product requirements. Once the material and substance data is captured by Teamcenter, product developers can relate this data to a hierarchical model that fully defines a part in terms of its underlying substances, material composition, technical materials, part composition and environmental part data.

The Teamcenter solution is equally adept at handling newly manufactured parts, as well as previously qualified parts. Rapid data capture is facilitated through Teamcenter's use of standard import/export facilities including its support for common exchange standards. After the part model is in place, product developers are able to analyze compliance at multiple levels, including at the manufactured material level (e.g., to determine RoHS compliance) and at higher levels (e.g., to facilitate multi-source worst case analyses or multi level aggregations for entire BOMs).

The integration between Teamcenter's requirements management solution and the PLM infrastructure allows product developers to extend compliance analysis through downstream lifecycle processes. As a result, products can be designed up front for re-use and recycling. This enables enterprises to incorporate compliance validation into standard processes driven

by Teamcenter's change management, xCAD integration, part qualification and strategic sourcing solutions.

In addition, users can leverage standard interfaces, including RosettaNet XML, Compliance Connect, IMDS and IPC-1752, to distribute a wide variety of reports and configurable applications to:

- Design teams
- Quality assurance teams
- Government regulatory agencies

Benefits from Teamcenter's environmental compliance solution

Facilitates design-for-compliance initiatives

Provides product developers with rapid visibility to all compliant and non-compliant components

Integrates compliance management capabilities into current business processes

Minimizes risk of non-compliance

Reduces total cost of ownership

Minimizes cost associated with excess and obsolete inventory otherwise caused by the use of non-compliant parts

Business challenges

Today, most people expect lead-free gas, an asbestos-free workplace and – especially in North America – smoke-free restaurants. Tomorrow, they will assume that the electrical and electronic equipment they use will be free of hazardous substances. Today, most people are accustomed to recycling newsprint, aluminum cans and glass. Tomorrow, they will be used to recycling the materials and components that comprise their electronic products.

Changes like this are endemic in today's fast moving modern economy and can adversely impact a company's financial success unless they are fully anticipated and systematically addressed.

This is why companies that develop electrical and electronic equipment – and the supply chains that support them – need to understand the overriding rationale, scope, implications and potential consequences of regulations such as the European Union's REACH, RoHS and WEEE directives – as well as the immediate requirements associated with these specifications. Similarly, for the past several years, the automotive industry also has been exposed to a variety of compliance requirements, including ELV regulations.

Time is short, yet strategic planning is needed given the consequences at stake. For example, if member nations in the European Union halt product shipments for non-compliance, the affected company

could be temporarily frozen out of a market for a period of time that could doom the product's strategic objectives. While this may sound drastic, consider the following precedent. In October 2001 – well before the European Union's current directives – the Dutch government instructed Sony Computer Entertainment Europe to temporarily halt shipments of its PS One game console because of excessive cadmium levels.

Non-compliance can damage the competitive position of manufacturers already struggling with the ebb and flow of today's global economy. Materials and component suppliers that fail to comply with new compliance-related reporting requirements can be devastated by the loss of a major customer. At the bottom line, these issues carry with them a monetary risk that needs to be mitigated.

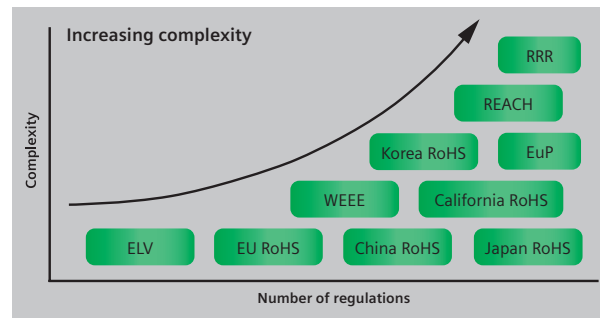


Figure 1: The list of environmental regulations aimed at reducing the use of hazardous substances in products is growing in size, complexity and scope.

Understanding ELV

Governments around the world are greatly concerned with the environment impact that results when automotive vehicles reach their end of life. For example, approximately two million vehicles reach their end of life in the United Kingdom every year. Currently, between 74 to 80 percent of the weight of a typical ELV is re-used and recycled.

With this in mind, the End-of-Life Vehicles Directive deals with cars, vans and certain classes of three-wheeled vehicles. The ELV directive's main requirements are for European Union member states to ensure that:

- Producers limit the use of specific hazardous substances in the manufacture of new vehicles and automotive components, as well as to promote the recyclability of these vehicles.
- ELVs are subject to de-pollution prior to dismantling, recycling or disposal.
- Treatment facilities operate to higher environmental standards and have permits that govern the handling of depolluted ELVs.
- Specified recovery and recycling targets are met by January 1, 2006 and January 1, 2015.
- Producers pay "all or a significant part" of the costs associated with treating negative or nil value ELVs at treatment centers by 2007.

Examining ELV in detail

The End-of-Life Vehicles Directive (2000/53/EC) adopted on October 20, 2000 seeks to promote the collection, re-use and recycling of vehicle components for the purpose of protecting the environment. In particular, the ELV directive requires European Union member states to ensure that ELVs can only be stored and treated in accordance with tightened environmental treatment standards.

Licensed sites, registered sites and storage sites In general terms, the directive requires that ELVs may only be treated at licensed sites, where “treatment” is defined as including depollution, dismantling, shearing, shredding, recovery and preparation for disposal. Such sites must meet standards for storage, depollution and dismantling as appropriate. Sites that only treat depolluted ELVs may operate without a license if they are registered with an appropriate environmental agency as being exempt from licensing. Such sites must meet standards for storage and treatment.

Sites where vehicles become waste and thus ELVs (sites of production) may store those ELVs without a license or registration provided that they still meet the standards for storage. Standards only apply to the extent that a relevant activity occurs (for example, the standard for storing dismantled spare parts only applies where spare parts are stored).

Application to all vehicles The ELV directive is aimed at certain classes of motor vehicles (essentially cars and light goods vehicles). However, the pollution potential of other vehicles (such as a heavy goods vehicle) is no different than its smaller counterpart. Motorcycles also have significant pollution potential. To apply different environmental protection standards to different classes of vehicles could pose significant compliance issues for the industry and make the enforcement of those standards impracticable in certain cases. With this in mind, some governments have decided that the same environmental standards should apply to all end-of-life motor vehicles irrespective of their class. When this kind of government guidance is provided, all end-of-life (i.e., waste) motor vehicles are referred to as ELVs.

The screenshot shows the 'Substance(s) of Concern Report' interface in TEAMCENTER. It includes a navigation bar with 'Home', 'Search', 'Upload', 'Manage', and 'IMDS'. The main content area is titled 'Substance(s) of Concern Report' and includes a 'Steps' section with five numbered steps: 1. Select Report Options, 2. Add or Edit Parts, 3. Review Material, 4. Generate Report, and 5. View XDC Report. Below this is a table of 'Current Selections' with columns for 'Component', 'Description', and 'Toxic and Hazardous Substances or Elements' (LEAD (Pb), MERCURY (Hg), CADMIUM (Cd), HEXAVALENT CHROMIUM (Cr)).

Component	Description	LEAD (Pb)	MERCURY (Hg)	CADMIUM (Cd)	HEXAVALENT CHROMIUM (Cr)
135-7255-01	GPS NAV CENTER ASSY	X	X	X	X
135-7255-01	BATT COVER	O	O	O	O
135-7255-01	SRIC IC UNIT A3EE7	O	O	O	O
248-4365-01	ANT COVER ABB	O	O	O	O
302-0145-01	RKD BAG RUBB-10MM RE 250	O	O	O	O
257-6786-01	PWR SUP UNIT 3V	X	O	O	O
257-6786-01	CAP CE 027UF 10V 5%SH 0504550VIE	X	O	O	O
257-6786-01	RES 120 OHM 3%	O	O	O	O
257-7333-01	ALM CAS COV TOP	O	O	O	O
257-7333-01	CHP COMP AC378	X	O	O	O

Understanding RoHS and WEEE

The RoHS and WEEE directives share many common definitions that are important in determining whether these regulations apply to specific suppliers and specific product offerings. Several key definitions stand out.¹

Electric and electrical equipment pertains to equipment that is dependent on electric currents or electromagnetic fields to work properly, equipment that facilitates the generation, transfer and measurement of these currents/fields and equipment designed for use with a voltage rating not exceeding 1000 volts for alternating current and 1500 volts for direct current.

Producers include any organization regardless of selling technique that:

- Manufactures and sells its own brand of electrical and electronic equipment
- Resells equipment produced by other suppliers under their own brand
- Imports or exports electrical and electronic equipment into a member state

Distributors include any organization that provides electrical or electronic equipment on a commercial basis to the party that uses it.

As the accompanying table indicates, the kinds of products covered by the RoHS and WEEE directives are similar.

Product areas covered by European Union environmental compliance²

Product category	RoHS	WEEE
Large household appliances	Yes	Yes
Small household appliances	Yes	Yes
IT and telecommunications equipment	Yes	Yes
Consumer equipment	Yes	Yes
Lighting equipment	Yes	Yes
Electrical and electronic tools ³	Yes	Yes
Toys, leisure and sport equipment	Yes	Yes
Medical devices ⁴	No	Yes
Monitoring and control devices	No	Yes
Automatic dispensers	Yes	Yes
Electronic light bulbs	Yes	No
Luminaries in households	Yes	No

Understanding China RoHS

China RoHS refers to the directive published by China's Ministry of Information Industry (MII) on March 1, 2006 and titled "Management Methods for Controlling Pollution Caused by Electronic Information Products Regulation." With an enforcement date of March 1, 2007, China RoHS establishes a broad regulatory framework for substance restrictions, pre-market certifications, labeling and information disclosure requirements. These requirements affect a wide range of products, parts and components defined as electronic information products (EIP) sold and imported within the People's Republic of China.

To satisfy China RoHS labeling requirements, all in-scope products must include labels indicating presence of the restricted substances and, if toxic substances are present, period of safe usage:



**Contains no
toxic substances**



**Contains toxic substances
Safe use period is 5 years**

Understanding Korea RoHS

The Korea Ministry of Environment (MoE) set January 1, 2008 as the compliance date for Korea RoHS, Act for Resource Recycling of Electrical and Electronic Equipment and Vehicles, but some of the most critical details have still not been released. There are some similarities with China RoHS and the European Union's (EU) RoHS and also many differences. For one, Korea does not require OEMs to label their product as compliant unlike China RoHS. All manufacturers have to do is register and say that their product will comply with the legislation.

Korea RoHS also has a recycling provision that differs from the EU's WEEE directive. The Korea act requires sellers of electrical/electronic equipment to provide free take-back of customer's old products and packaging materials for new products. Sellers are also responsible for transporting collected wastes to a collection depot/recycler.

Examining RoHS in detail⁵

Affected substances Beginning in July 2006, manufacturers will need to comply with RoHS by demonstrating that their products do not contain more than the maximum permitted levels of:

- Lead (Pb)
- Mercury (Hg)
- Cadmium (Cd)
- Hexavalent chromium (Cr VI)
- Polybrominated biphenyls (PBB)
- Polybrominated diphenyl ethers (PBDE)

The maximum permitted levels are proposed to be 0.01% by weight for cadmium in any individual homogeneous material and 0.1% for the other substances. Initially, there was some debate as to the definition of a “homogeneous material” and whether this reference applies to a component or assembly. This has been clarified and a “homogeneous material” is now known to be a single substance such as a plastic (e.g., the plastic used in the insulation of a wire is considered to be a single substance). The assembly of “wire + insulations” is not considered to be a single substance, but rather a component.

A component may contain several different materials, each of which must be considered separately.

Exemptions The RoHS directive lists several significant exemptions, but these mainly relate to the use of materials in non-plastic applications and are not listed here. A full list of current exemptions appears in the annex to the RoHS Directive.

Additional product and application exemptions have been requested (e.g., for light bulbs) and are currently being considered by the European Union. While it is unlikely that all of the requested exemptions will be granted, it should be noted that most of these requests do not affect the application of plastics in WEEE.

Where the affected substances are likely to be used in plastics In most cases, the affected materials have already been phased out for plastics processing because of rising environmental concerns. Examples of previous uses include:

Lead. Lead-based stabilizers have been used in PVC in the past for a variety of uses but have largely been superseded by other stabilizer systems such as Ba/Ca/Sn systems.

Cadmium. Cadmium has been used as a red colorant in many places in the past, but has been replaced by alternative colorant systems.

Hexavalent chromium. This material has been used in metallizing of plastics and is being rapidly phased out by alternative processes that are less environmentally damaging.

PBB and PBDE. These substances have been used as flame retardants in a range of plastics but the substitution of other flame retardants has already taken place in many instances.

Part Number	Part Name	LDR	Pre-Consumer Recycled (%)	Post-Consumer Recycled (%)	Tolerance	
19-5777-02		1.5	0	3.8	0	
Subpart Name	Material	Manufacturer	Substance	Class/Category	CRS Number	Miss %
N/A	CERAMIC	SUPPL099	CALCIUM CLAY	7.2 CERAMICS / GLASS	84402-68-4	0.45 100
	LEAD	SUPPL093	LEAD	3.3 LEAD		0.945 3
	HOLDING COMPOUND	SUPPL0914	LEAD	5.60-10.0 LEAD COMPOUNDS	7429-83-1	0.565 100
			ALUMINUM SILICATE COMPOSITE	OTHER	1332-08-7	0.212 30
			ACETOXYDIPICOLIC-2-ONE	OTHER	20039-74-9	0.212 30
			FIBROUS-GLASS-WOOD	OTHER	8997-51-3	0.27 10
			MISC. NOT TO DECLARE	OTHER	SYSTEM	0.212 30
	NICKEL ALLOY	SUPPL0916	MISC. NOT TO DECLARE	3.4 NICKEL ALLOYS		0.3 20
			MISC. NOT TO DECLARE	OTHER	SYSTEM	0.006 2
			NICKEL OXIDE (NiO)	NICKEL (ON PROLONGED SKIN CONTACT) ENVIRONMENTALLY PERSISTENT (LONG TERM EFFECTS) CARCINOGENIC CATEGORY 1 OR 2; ALLERGENIC	1314-06-3	0.294 68

Examining China RoHS in detail

There are a number of significant differences between the China RoHS and EU RoHS Directives which are causing major concerns to companies pioneering China-specific compliance activities.

China RoHS not only puts tighter requirements on the types of product classes required to comply and requires product pre-certification prior to sale, but it is also reviewed annually (unlike the EU RoHS Directive which is reviewed every four years) and has other elements that are much more stringent than the original RoHS Directive:

- Labeling and marking: Products in scope must provide labels and marking indicating restricted substances and their location within the product, packaging material content, safe use period and recyclability information.
 - Restricted substances: To the six EU RoHS restricted substances, China adds “other toxic and harmful substances” with no further definition. Certificates of compliance can no longer be used as the minimum standard for product due diligence.
 - Exemptions: China RoHS has not yet defined any formal exemptions. The Product Catalog, which will define products in scope, will also describe any applicable exemptions.
 - Responsibilities and penalties: Unlike the EU RoHS Directive, the China RoHS law affects the entire supply chain, including manufacturers, distributors, importers and retailers any of whom may be penalized for non-compliance.
2. Innovation to improve the recycling of materials and structure in products: This will incorporate design for disassembly best practices (DFD), using fewer and more easily recyclable materials, and disclosure of material composition information (and disassembly methods) to recyclers.
 3. Collection of products at no cost to consumers: Manufacturers/importers of electrical/electronic equipment and vehicles must take back or designate a collection depot for proper recycling of products.
 4. Recycling rate: Korea RoHS establishes a mandatory recycling rate for manufacturers/importers of electrical/electronic equipment that is proportionate to their market share. Vehicle manufacturers/importers will receive an annual recycling rate prescribed by the Presidential Decree.
 5. Recycling Information Network: Manufacturers/importers must provide recycling information to the Recycling Information Network, presumably an online database that will be used to provide recyclers with information about material composition and recycling methods for their products, “to the extent confidential business information is not disclosed.”

Examining Korea RoHS in detail

Korea RoHS only provides a framework for holding manufacturers and importers responsible for the use of substances in their products. The Ministry of Environment (MoE) will have an advisory Eco-Assurance Review Committee to decide the specifics of the act at a later date.

Currently, the act contains five major requirements for manufacturers and importers:

1. Restrictions on the use of hazardous substances: Restrictions will apply to obvious substances such as heavy metals and flame retardants in electrical/electronic equipment and vehicles but there are expected to be provisions for exceptions when there are no substitutes or if it’s difficult to eliminate the use of hazardous substances.

Examining WEEE in detail

Implications The WEEE directive covers the design and production of electrical and electronic equipment and its ability to facilitate the recycling of redundant electrical equipment and the passage of the recycling responsibility back to the producer. The directive probably will introduce a recycling levy as an element in the price of new equipment.

Member state requirements The WEEE directive places the following requirements on European Union member states.

- Member states must set up systems that encourage the separate collection of WEEE, as well as systems that allow return of WEEE free of charge.
- Member states must achieve a collection rate of at least 4 kilograms per inhabitant per year (on average) of WEEE from private households.
- Member states must ensure that all WEEE collected from private households is transported to authorized treatment centers.
- Member states must ensure that producers establish systems to provide for the recovery, re-use and recycling of WEEE according to defined targets that are a proportion of the WEEE collected from private households.
- Member states must report WEEE targets on a regular basis.

While there is no mandatory requirement for individual householders to separate WEEE at the source, member states are expected to encourage behavior leading to recovery, re-use and recycling.

In addition, retailers must ensure that WEEE is taken back (on a one time basis) when an equivalent new product is sold. However, member states can allow retailers to make other arrangements provided that they are free of charge to the consumer.

Understanding REACH

Designed to replace more than 40 existing directives with one overarching regulation, REACH consists of 1,000 pages of legal text and technical annexes. It has been described as one of the most complex texts in the history of the EU.

From a manufacturer’s perspective, REACH can be viewed as part of an escalating regulatory trend – one that places increasing responsibility on manufacturers regarding the environmental and health impacts of their products.

REACH is much larger in scope compared to other EU regulations, such as RoHS and ELV, affecting more industries, more products, and concerning many more substances than either ELV or RoHS:

- It’s been estimated that REACH will eventually ban 1,500 to 3,000 substances of very high concern (SVHC), which will be either authorized or prohibited under the regulation.
- These regulatory ideas originated in the EU, but similar regulations are being developed throughout the world. As a result, manufacturers will find it increasingly complex and costly to develop and market globally compliant products.

Row	Manufacturer Part #	Commercial Part	Component Code	Manufacturing Part	Manufacturer	Material	Status	Requested	Software	ADMS(C)	ADMS(E)	ADMS(S)	REACH
1	31.11011.01	11.11011.01	PASSIVE	CAR ST	SIEMENS	C	Not Requested	28-03-14					
2	32.1112.01	32.1112.01	PASSIVE	CHIP-COMP	SIEMENS	SIEMENS	Not Requested	11-01-13					
3	32.1112.01	32.1112.01	PASSIVE	13 50W BATT	SIEMENS	SIEMENS	Not Requested	11-01-13					
4	32.1112.01	32.1112.01	PASSIVE	NEW UNIT	SIEMENS	SIEMENS	Not Requested	11-01-13					
5	32.1112.01	32.1112.01	PASSIVE	METAL WIRE	SIEMENS	SIEMENS	Not Requested	11-01-13					
6	32.1112.01	32.1112.01	PASSIVE	ANTENNA	SIEMENS	SIEMENS	Not Requested	11-01-13					
7	32.1112.01	32.1112.01	PASSIVE	SAFT COVER	SIEMENS	SIEMENS	Not Requested	11-01-13					
8	32.1112.01	32.1112.01	PASSIVE	CAR CR	SIEMENS	SIEMENS	Not Requested	11-01-13					
9	32.1112.01	32.1112.01	PASSIVE	SYSTEM	SIEMENS	SIEMENS	Not Requested	11-01-13					
10	32.1112.01	32.1112.01	PASSIVE	ASSEN MAIN	SIEMENS	SIEMENS	Not Requested	11-01-13					
11	32.1112.01	32.1112.01	PASSIVE	ASZ BRANCH	SIEMENS	SIEMENS	Not Requested	11-01-13					
12	32.1112.01	32.1112.01	PASSIVE	SCREEN LCD	SIEMENS	SIEMENS	Not Requested	11-01-13					
13	32.1112.01	32.1112.01	PASSIVE	SPKR MAG	SIEMENS	SIEMENS	Not Requested	11-01-13					
14	32.1112.01	32.1112.01	PASSIVE	HEAD KIT	SIEMENS	SIEMENS	Not Requested	11-01-13					
15	32.1112.01	32.1112.01	PASSIVE	CON ROSE	SIEMENS	SIEMENS	Not Requested	11-01-13					

Examining REACH in detail

REACH entered into force on 1 June 2007 and is intended to ensure that all chemicals are tested and used in safe ways. It requires all chemicals of one ton or more in volume that are produced in or imported into the European Union each year to be tested and registered with a new central European authority – the European Chemicals Agency (ECHA) located in Helsinki, Finland. And although REACH certainly affects chemical manufacturers, it also has a profound impact on the makers of all products – even those not sold in Europe. REACH also regulates chemicals that are considered to be of very high concern to human health or the environment – regardless of volume. Producers and importers of these substances of very high concern (SVHC) may be required to investigate their effects on human health and the environment and may require specific authorization from the ECHA for use. So, whether your company makes computers, automobiles, toys or textiles – or the components that go into these products – you need to understand REACH and take action now to get your products ready for REACH.

The new REACH agency – the ECHA – oversees the four key procedures of the law:

1. **Registration:** Registration is an information gathering and risk management exercise. Manufacturers of substances that are imported into the EU in quantities over 1 metric ton per

year must register these substances by submitting a dossier that includes data on the chemical's properties, uses and safe management. The goal is to have one registration per substance so companies may have to register jointly.

2. **Evaluation:** The agency evaluates the registration information to determine the chemical's hazards and risks.
3. **Authorization:** Authorization applies to SVHCs and will be company-specific, use-specific and time-limited. Lists of candidate and official SVHCs will be issued on a rolling basis. The 1 metric ton threshold doesn't apply to authorization.
4. **Restriction:** The goal of authorization is to find safe alternatives for the SVHCs and eventually restrict, or ban, these substances for specific uses.

The regulation also calls for the progressive substitution of the most dangerous chemicals when suitable alternatives have been identified. REACH provisions will be phased-in over 11 years but it encourages manufacturers and importers of such chemicals to pre-register them during the 6 month pre-registration period – June 1, 2008 to December 1, 2008. This will give the companies more time before they have to test and fully register the chemicals.

Teamcenter’s environmental compliance solution

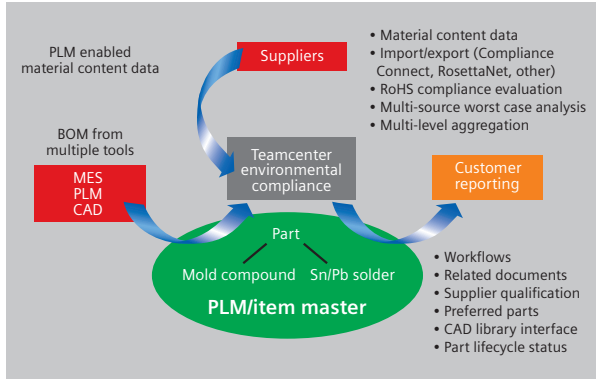


Figure 2: Teamcenter’s environmental compliance solution.

- Integrate this compliance-related information into standard Teamcenter-driven business processes, including change management, xCAD integration, part qualification, strategic sourcing workflows, new part quest and supplier information processes.
- Rapidly disseminate a wide variety of standard and customized reports to the manufacturer’s own product teams, as well as to external suppliers and government regulators by using today’s most popular data exchange protocols.

As the accompanying table indicates, Teamcenter’s environmental compliance solution facilitates a variety of key functional capabilities.

Teamcenter’s solution for environmental compliance enables manufacturers to:

- Capture a comprehensive set of material and substance data (from multiple supply chain sources) and retain it in the form of product requirements.
- Capture and trace compliance requirements for specific markets.
- Track program management compliance milestones.
- Manage these material/substance requirements in a product-related context that enables producers to effectively analyze components, parts, assemblies and rolled up BOMs in terms of their ability to comply with multiple environmental compliance regulations, including the REACH, ELV, RoHS and WEEE directives.

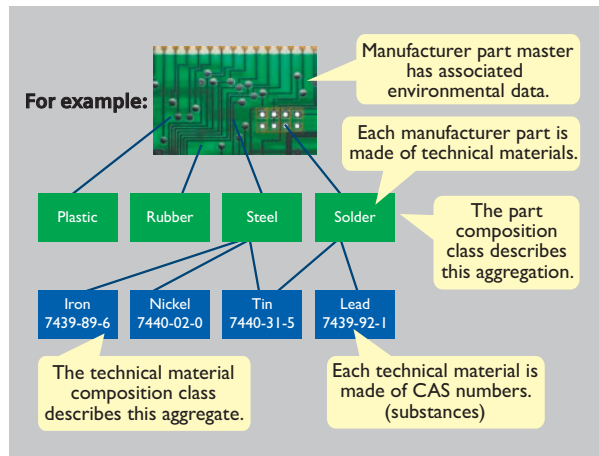


Figure 3: Material break-down.

Key Teamcenter environmental compliance capabilities

Teamcenter function	Business value
Requirements capture and traceability	Creates a complete set of requirements that are traceable back to their original sources, including to environmental regulations. Teamcenter's web-centric orientation provides all users with access to product requirements through standard internet browsers. All team members work from the same set of requirements, with access to reports and view/editing supported in real time. Full integration with common Windows desktop applications – including Microsoft Word, Excel and Visio – provides information in a familiar format that requires zero learning curve on the part of users.
Program management	Enables program teams to collaboratively plan and manage take-to-market projects by synchronizing team-oriented tasks schedules and resource allocations on a real-time basis. Cross-discipline teams, including teams responsible for product management, can create and share project information over the web in a real-time environment by tracking program compliance milestones that drive product availability.
Multiple levels of compliance management	Enables manufacturers to analyze products to determine whether they meet environmental compliance thresholds at multiple levels including at the substance, material, part, assembly and rolled up BOM levels (as illustrated by Figure 3).
Lifecycle parts management	Facilitates end-of-life management by leveraging manufacturer parts status, certification and impact as a source for commercial (company) parts and compliance status rollup.
Automatic compliance validation	Facilitates automatic compliance validation against multiple standards, including: <ul style="list-style-type: none"> • EU RoHS • REACH • China RoHS • ELV • Korea RoHS • or "company-specific standards" • WEEE <p>Teamcenter provides XML templates for specific controlled substances and supports the management of regulatory exemptions, as well as multiple status levels.</p>
Aggregation across multiple sources	Supports content and compliance aggregation across components supplied from multiple sources.
Easy data exchange	Enables manufacturers, suppliers and regulators to exchange material content data, BOMs and compliance reports using widely accepted protocols, including: <ul style="list-style-type: none"> • IPC-1752 (material content declaration) • AIAG Compliance Connect spreadsheets • International Material Data System (IMDS) • RosettaNet 2A10, 2A13 and 2A15 PIPs

Key Teamcenter environmental compliance capabilities (*continued*)

Teamcenter function	Business value
Integrated compliance processes	Enables manufacturers to integrate environmental compliance requirements into Teamcenter-driven lifecycle processes, including workflows that pertain to change management, xCAD integration, strategic sourcing (supplier qualification) and part qualification.
Compliance at multiple points	Enables manufacturers to grade their products for compliance at any stage in a Teamcenter-managed product lifecycle.
Open architecture	Facilitates an open approach to environmental compliance by leveraging technology that facilitates: <ul style="list-style-type: none"> • J2EE-compliant web application • LDAP user authentication • Configurable views to backend data sources
Part compliance data management	Facilitates technical material and substance management at the manufacturer part, company part, engineered part and assembly levels.
End-of-life management	Leverages manufacturer part status, certification and impact as a source for commercial (company) part and compliance status rollup. Approved vendor and qualified part management ensures that only qualified parts from approved vendors are available for use in project designs.
Compliance reporting	Provides a flexible framework for supporting internal and external requirements, including BOM grading reports and compliance certification.

Summarizing Teamcenter's environmental compliance pay-off

Teamcenter's environmental compliance solution enables product makers to link compliance-related requirements and material data to all of the processes that support the product lifecycle. As a result, OEMs and suppliers in all industries can gain full end-to-end visibility to all of the product-related regulatory compliance issues that impact their own organizations, as well as their supply chains. This enables companies to drive hazardous substances out of their product offerings and avoid serious compliance-related problems including product recalls, regulatory fines, product bans, customer dissatisfaction and brand value/image damage. Teamcenter's targeted PLM solution enables you to analyze and track compliance at the substance, material, part and product levels. As your single-source of all product and process knowledge, Teamcenter enables you to centrally manage compliance, as well as:

- Efficiently collect and manage the environmental data from your suppliers in a variety of formats, ranging from basic certificates of compliance to the industry-standard IPC 1752 form, to direct links to the IMDS automotive industry database.

- Grade your products with respect to multiple compliance standards such as REACH, WEEE, ELV and RoHS, or establish your own corporate standard.
- Quickly produce detailed reports that show a product's compliance – in all its "as built" permutations.

Teamcenter-enabled PLM enables companies to strengthen their compliance initiatives by facilitating an overall "compliance framework." Companies are able to meet the requirements of regulatory compliance in the same PLM environment they use to accelerate product development and increase their product introduction capacity. By applying a comprehensive PLM strategy to your product development process you not only reduce the costs associated with becoming and maintaining compliance, but also ensure that products are designed right the first time, thereby maximizing your return on investment.

References

1. RoHS and WEEE: The Essentials, Zeus Technical Whitepaper, Zeus Industrial Products, Inc., 2005.
2. Ibid.
3. Except for large-scale stationary industrial tools.
4. With the exception of all implanted and infected products.
5. The sections on “Examining RoHS in detail” and “Examining WEEE in detail” were excerpted en masse from RoHS and WEEE: The Essentials, Zeus Technical Whitepaper, Zeus Industrial Products, Inc., 2005.

Teamcenter for Environmental Compliance – powered by EMARS Synapsis Technology, Inc. provides environmental compliance and product lifecycle management (PLM) solutions. EMARS, Synapsis’ Environmental Material Aggregation and Reporting System and its Compliance Checker are patent-pending solutions that enable companies to comply with environmental regulations, such as ELV, RoHS and WEEE, among others. www.synapsistech.com

About Siemens PLM Software

Siemens PLM Software, a business unit of the Siemens Industry Automation Division, is a leading global provider of product lifecycle management (PLM) software and services with nearly 6.7 million licensed seats and 63,000 customers worldwide. Headquartered in Plano, Texas, Siemens PLM Software works collaboratively with companies to deliver open solutions that help them turn more ideas into successful products. For more information on Siemens PLM Software products and services, visit www.siemens.com/plm.

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