ISSN 1392-2785 ENGINEERING ECONOMICS. 2006. No 3 (48)
THE ECONOMIC CONDITIONS OF ENTERPRISE FUNCTIONING

The problems of Implementation of the European Union Directives for Electrical and Electronic Equipment Hazardousness

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The problems of implementation of two new EU Directives is discussed in this article. It is so called WEEE (Waste Electrical and Electronic Equipment) and RoHS (Restriction of use of certain Hazardous Substances in electrical and electronic equipment), as well as influence of these directives to quality and environmental management systems. The RoHS directive requires a number of potentially hazardous substances (lead, mercury, cadmium, hexavalent chromium, polybrominated byphenyls (PBB) and polybrominated diphenyl ethers (PBDE)) to be phased out by 1 July 2006. Both directives will help reduce the environmental impact of electrical and electronic goods at the end of their life and contribute towards our sustainable development.

The overall situation of legislation strenghtening, especially in globalization context, is analysed, including examples from the USA, Japan and China. There are suspects that EU directives RoHS and WEEE are just the beginning of a long period of environmental regulations. We may have entered a decades-long period where the chemical makeup of electrical and electronic components will be a big part of business success. The principles of sustainable design and integrating environmental aspects into product design are presented.

The main problems of RoHS and WEEE implementation are discussed (totally 17 problems are highlighted and defined). The experience about these directives implementation in the company "Ekranas", producing colour picture tubes, is presented. An example of integrating RoHS and WEEE systems into quality and environmental management system using the same key elements and processes are given in the table. Decision tree, which is used in the company "Ekranas" to guide decisions on compliance issues, is shown in the figure. The list of literature is presented.

Keywords: *electrical and electronic equipment, hazardous substances, waste management, expenses, quality and environmental management systems, integration.*

Introduction

Knowing, that Lithuania is integrated into the European Union (EU) and company's "Ekranas" aspirations in Europe and other regions is constantly growing, all circumstances have big influence on the competitiveness.

Inseparable part of business still remains the necessity to have various certificates for management systems and products, despite big expenses needed for certification.

For example, the colour picture tubes (CPT) produced by the company "Ekranas" are safe for explosion, ionizing radiation and fire what is proved in the certificates from Great Britain, Germany, USA, Russia etc. It is not new, because these essential requirements (which are constantly becoming stricter) written in the standards existed from the very beginning of the tubes production.

But during the recent several years two new EU directives were adopted.

One of them is WEEE directive (Waste Electrical and Electronic Equipment). Lithuania shall ensure that by 2008 at the latest a rate of separate collection of at least 4 kg. on average per inhabitant per year of WEEE from private households is achieved. The system of the waste collection, separation and recycling has to be developed. It affects the company "Ekranas" indirectly, but it necessary to know that after some period of time CPT will become the main waste from a TV set. Part of the expenses related to wastes will be shared out to producers.

In order to make these future wastes less hazardous for humans and environment as possible, so called RoHS (Restriction of the use of certain Hazardous Substances in electrical and electronic equipment) directive is adopted. The list of the substances which are restricted to use in the mentioned equipment is presented in this directive. This is lead, mercury, cadmium, hexavalent chromium, polybrominated biphenyls (PBB) and polybrominated diphenyl ethers (PBDE). Thus, it is necessary to prove for the customers and authorities, presenting certificates from various testing laboratories, that CPT produced in the company "Ekranas" do not contain these substances or contain permissible limits as well as necessary to have management system adopted to the EU directives and customers' requirements fulfilment assurance. All this inevitably increase expenses and prime cost, reduce profitability what is especially unacceptable in global competition conditions.

Problem and its relevance. The problem is that in Lithuania there is the lack of scientific research data and overall information, especially in the context of the globalization, about changes related with the products hazardousness to environment reducing requirements. This is especially urgent for electrical and electronic equipment, because the EU directive's RoHS requirements will be in force from 1 July 2006.

Subject of research. In this article the problems of implementation of the EU directives for electrical and electronic equipment hazardousness in globalization con-

text as well as influence of these directives on quality and environmental management systems is investigated.

Literature's review. Goodman (2005) analyses in detail the requirements of the RoHS directive, scope, exemptions, alternatives to the restricted substances, the problems concerning approach to compliance. Significant expenses will be incurred by some producers, especially during the transitional period. According to Spiegal (2005), European environmental regulations are the most significant challenges facing the electronic industry. The author analyses the problems encountered by the US distributors.

One of the ways to avoid environmental problems is to change the point of view to the design and development methods. There is a lot of scientific literature about this subject as well as standards ISO/TR 14062:2002, ECMA-341 are issued. Lewis et. al. (2001) provide a step-by-step approach to how to design a product that meets requirements for quality, cost, manufacturability and consumer appeal, while at the same time minimising environmental impact. The first step in the process is to use life-cycle assessment. Guidelines are provided for each of the critical stages of electrical and electronic product life, from the selection of raw materials through to strategies for recovery and recycling.

In the recent works (McDonough, 2002; Alastair, 2002) there are given many examples and practical recommendations according to ecological design. It is stated that it is necessary to design new products taking nature itself as our model for making things: not "cradle to grave", but "cradle to cradle" (McDonough, 2002). Schneiderman (2005) reveals, that only 54.9% of the journal Electronic Design readers responding to the online survey said they are "confident" that their companies will fully comply with EU RoHS directive by the deadline. According to Jorgensen (2005), it is hard not to get panicky over Europe's impending RoHS, especially considering the scope. For example, the world's largest catalog distributor of electronic components NewarkInOne, stocks more than 165,000 parts that commonly contain the banned materials. The four successive phases of the process for RoHS compliance: Education, Planning, Implementation and Self-Declaration, are detailed by Lasky et. al. (2005).

Widmer et. al. (2005) are discussing global perspectives on electronic waste. WEEE today already constitutes 8% of municipal waste and is one of the fastest growing waste fractions. Hilty (2005) is emphasising electronic waste like emerging risk for producers, importers and users. Schmidt (2005) is presenting approach how to determine the system revenue and the system expenditure in the electronic waste sector. Environmental management problems connected with long and complicated supply chain is discussed (Karp, 2005).

Goals and tasks of the article. The main objective is to present the analysis of the EU directives for electrical and electronic equipment hazardousness, emphasizing the importance of these directives in the globalization processes. Tasks:

- to analyse recently existing environment of the strictening requirements;
- to define problems related with the implementation of the EU directives for electrical and electronic equipment hazardousness;
- to present mentioned directives implementation and integration into existing quality and environmental management system practical recommendations using company's "Ekranas" example.

Research methods. For the problem analysis the study of scientific literature, legal requirement documents, internet information sources and generalization of long practical experience working in quality and environmental management field have been applied.

The environment of the strictening requirements

In Lithuania WEEE directive was adopted bringing into force the regulation "The rules of electrical and electronic wastes management", and RoHS directive – by amending hygiene standard HN36:2002 "Forbiden and limited substances". WEEE and RoHS directives are applied to all activities related with electrical and electronic equipment manufacturing, reselling, importing, waste management etc. Electrical and electronic equipment means equipment which is dependent on electric currents or electromagnetic fields and equipment for the generation, transfer and measurement of such currents and fields and designed for use with a voltage rating not exceeding 1000 volts for alternating current and 1500 volts for direct current. The following categories of electrical and electronic equipment are set, including a lot of separate products:

1) large household appliances (refrigerators, stoves, radiators etc.);
2) small household appliances (vacuum cleaners, irons etc.);
3) IT and telecommunications equipment (computers, telephones, copying etc.);
4) consumer equipment (television sets, audio, musical instruments etc.);
5) lighting equipment (various lamps);
6) electrical and electronic tools (with the exception of large-scale stationary industrial tools);
7) toys, leisure and sports equipment;
8) medical devices (with the exception of all implanted and infected products) (RoHS directive is not applicable);
9) monitoring and control instruments (RoHS directive is not applicable);
10) automatic dispensers.

Starting from 1 July 2006 it will be prohibited to enter into EU or produce equipment not compliant with the RoHS directive. Electrical and electronic equipment shall be marked with the symbol, indicating separate collection of these equipment. Directives encourage producers to establish certified environmental management systems.

It is necessary to notice that increased attention to the environmental problems in Europe was started in 1976 when directive on substances classified as cancerogenic, mutagenic and toxic was adopted.

Till now in Europe there were put in force a lot of di-

rectives forbidding and limiting the use of specific substances and products with them, because their hazardousness to the human health and environment is proved by scientifical research and confirmed by international practice (for batteries and accumulators, cadmium usage in plastics and paints, vehicles waste, asbestos usage, ozone depletion materials, packing and package waste management and others). But such big impact, that electrical and electronic industry undergoes after adopting RoHS and WEEE directives, has not been yet felt. According Spiegal (2005), "this may be just the beginning of a long period of environmental regulations. We may have entered a decades long period where the chemical makeup of our components will be a big part of how we do business". Producers from Asian countries understood very well the importance of this and are zealously carrying into effect requirements of these directives and have determined that their products as well as electronic components comply with RoHS directive at present.

Similar legislation is pending all over the world. Japanese manufacturers have long been proactive when it comes to the environment, but still do not have similar to RoHS legislation. State-by-state environmental legislation is being developed across the United States. In the US there is also the prospect of national law to consolidate and ultimately supersede legislation from individual states (Spiegal, 2005). In September 2005 China issued the draft of the environmental law governing electronic components similar to RoHS and released for industry review. The impact of this law is wider than RoHS and non-compliance penalties are possible for the complete supply chain and not just producers. The law will require all products to be tested by China's certified laboratories in a much tougher compliance regime than RoHS self-certification.

Moreover, EU Parliament is discussing a new regulation. It will be a so - called REACH system (Registration, Evaluation and Authorization of Chemicals). The main point is that practically all chemical substances getting into EU or produced there (more than 1 ton per year) would have to be registered, evaluated and authorized. Mentioned regulation would enable to change recently in force more than 40 legal requirements documents which are not effective. Suppliers should evaluate the degree of riskiness of chemical substances. It would be a complicated and expensive system, but despite this the main motivation is to save lives of European peoples as well as to protect environment from hazardous substances impact.

It is possible to make prognosis that the mentioned two directives RoHS and WEEE and introduced REACH system will have big impact on the electrical and electronic equipment design and technology, on the quality and environmental management systems and will stimulate innovations. All this will require additional expenses from producers.

The problems of the implementation of the EU directives for electrical and electronic equipment hazardousness

After carrying-out the analysis of the implementation RoHS and WEEE directives the following problems are highlighted and defined:

1. In most cases the scope of RoHS usage is clear, but e.g. in specialized or industrial sectors there are a lot of doubt (the difference between "equipment" and "components or sub-assemblies" is not defined).
2. It is not clear how the definition of the maximum concentration values will be interpreted. At present, several different interpretations of „homogeneous material" are in circulation: 1) assemblies (modules, printed circuits); 2) components; 3) in materials (metals, plastic, ceramic).
3. A small number of standards exists and they are suitable for the analysis of the parts used for or within electrical equipment to determine the concentrations of the banned substances and they will not be available by the 1 July 2006 deadline. Most standards in this area are for other materials such as pollutants in the air and water.
4. There is the need for a standard about the use of symbols and markings on components or equipment to show RoHS compliance.
5. CASCO (Committee on conformity assessment), in liaison with BIPM, IAF, IFAN, IQNet, OIML and others, have prepared standard ISO/IEC 17050-1 for supplier's declaration of conformity. But not all customers still accept it.
6. Producers require a guidance on the RoHS requirements (as good example is the guidance for Packaging directive). The Packaging directive was adopted in 1994, guidance in 1999, standards in 2000.
7. The order of compliance to RoHS directive is not defined. Self-declaration is used for New Approach directives and is suitable for the RoHS directive even though RoHS is not a New Approach directive.
8. The questions related with reliability of declarations and test reports exist.
9. Some companies or certification organizations are developing their own systems, creating names. It is hard for suppliers to accommodate and fulfil different customers' requirements (e.g. SAMSUNG programs "Eco Partner", "Green Purchasing"; Texas Instruments RoHS "Gold"; cables certification BASEC (Great Britain) "Eco-Green" and a lot of others).
10. A RoHS Network to co-ordinate market surveillance in all Member States should be established (similar to that set up by the European Commission for the New General Product Safety directive).
11. Some manufacturers already use their special websites (e.g. SAMSUNG), where producers (suppliers) asked to put detailed information about their product composition, declarations, measurement reports, reveal from what sources are materials etc. There is a confidential information leakage danger, and that is especially actual in the globalization processes.
12. Big work is involved and the same time additional expenses (for laboratory analysis and pa-

perwork) in order to evaluate compliance to RoHS directive (e.g. Japan company Panasonic have already checked about 1,3 mln. components used in various products, 96 % of them changed).

13. Some companies require data from their suppliers not only in the scope of RoHS and WEEE but also add asbestos, ozone depleting materials questions etc. Furthermore, they are not limiting required information only about product, but expanding to package and in suppliers technological processes used materials.
14. Implementation of the RoHS directive will directly influence the products reliability and durability (e.g. using lead-free soldering).
15. In order to fully implement WEEE directive there is need to change a lot of legal requirements in Lithuania (e.g. "Codex of administrative laws violations").
16. Absence of a tax for electrical and electronic equipment waste burdening implementation of the WEEE directive.
17. The exemptions to use hazardous substances listed in the RoHS directive are just provisional. Till 2010 they all will be reviewed. Practically, there is no other way for electrical and electronic industry participants like to seek all products "greenness".

The experience of company „Ekranas" implementing EU directives for electrical and electronic equipment hazardousness

More than one year company "Ekranas" sends information to the customers about produced tubes compliance to the RoHS directive. Especially close relationships are with companies BEKO, VESTEL, Profilo Telra, SAMSUNG, that are distinguished for their increased insistence.

In managerial aspect RoHS and WEEE systems are gradually step-by-step integrated into existing business management system based on quality and environmental management system (Q&EMS) created according international standards ISO 9001 and ISO14001. The principles of the quality management methods integration (Vaišvila et. al., 2005), which are tested in long practical experience, can be successfully applied in this case.

The information about RoHS and WEEE systems main elements integration into existing Q&EMS is presented in the table.

Table

RoHS and WEEE systems integration into Q&EMS, using company's "Ekranas" example

The name of Q&EMS process	ISO 9001 clause	ISO 14001 clause	Example of integration activities
Standards control	4.2.3; 4.2.4	4.4.4	Ekranas is Lithuanian Standardization Department TC1 member enabling direct access to IEC TC/SC "Electronic tubes" and to get the newest information (e.g. Japan has proposed new work for the international standard "Refined CRT cullet" describing composition, cleanness and determination methods)
Information exchange	5.5.3	4.4.3	Printing of the publications about RoHS and WEEE in local media. Information exchange with similar companies
Internal audit	8.2.2	4.5.5	RoHS questionnaire created and used during audits
Tubes testing	8.2.4	4.5.1	Sending some components to the accredited laboratories for RoHS tests. Gathering information about laboratories
Monitoring and measurement of product (in laboratories)	8.2.4	4.5.1; 4.5.4	Gathering information about substances testing methods. Testing and test reports issued for some materials
Customer communication	7.2.3; 8.2.1	4.4.3	Sending of the RoHS and WEEE declarations to the customers. Measuring of the customers satisfaction
Purchasing of components and raw materials	7.4	4.3.1; 4.4.6	Getting declarations and test reports from suppliers. Suppliers management
Input control	7.4	4.3.1	Verification of the purchased products
Preparation of and production of glass components and tubes	7.3; 7.5.3	4.3.2; 4.4.6	Using of the standard ISO/TR 14062. Implementation of ecological design methods
Information technology control (IT)	6.3	4.4.3	Connection with the customers and suppliers websites and RoHS databases. Addition of existing Lotus-Notes system
Control of corrective and preventive actions	8.5.2; 8.5.3	4.5.3	The information is got that WEEE directive might be amended introducing separate product category – special for tubes waste. Coordinating group for glass waste from old TV and displays recycling possibilities in Lithuania is organized
Environmental aspects identification	-	4.3.1	Procedure is amended by RoHS and WEEE requirements
Environmental legal requirements	5.1	4.3.2; 4.5.2	Existing EMS have been recertified according to new standard ISO 14001:2004 version, which is stricter in legal requirements area
Waste handling control	-	4.3.2; 4.4.6; 4.5.4	Procedure is amended by WEEE requirements
Training and competence	6.2.2	4.4.1; 4.4.2; 4.5.5	Organization of seminars and training about RoHS and WEEE. Auditors training

According to Goodman's (2005) recommendations in the company "Ekranas" there is used decision tree to guide decisions on components or materials RoHS compliance issues. An example of this is shown in Figure.

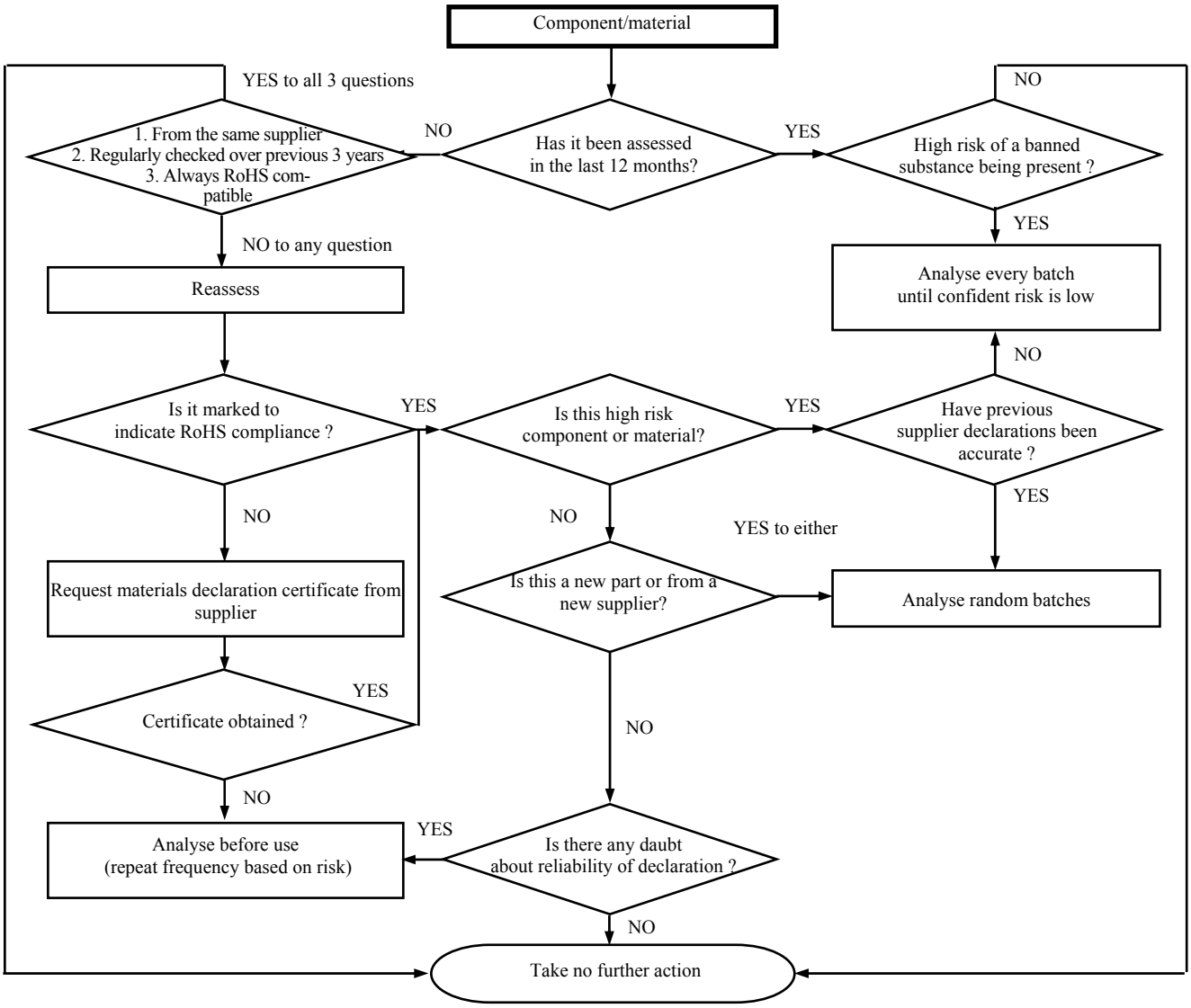

Figure. Example of the decision tree

Conclusions

1. It is expected that RoHS and WEEE compliance declaration and maintenance expenses will be bigger than in traditional safety (for product and environment) assurance systems. Additional facilitation is to have the certified EMS according standard ISO 14001.
2. The experience of the RoHS and WEEE systems implementation once again prove, that managerial methods and systems integration tendency is inevitable and fields of this integration are constantly expanding.
3. RoHS and WEEE directives may be just the beginning of a long period of environmental regulations multiplication and their execution in big part will settle the electrical and electronic equipment development tendencies in future, especially in the global competition conditions.

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Europos Sąjungos direktyvų dėl elektros ir elektroninių gaminių kenksmingumo diegimo problemos

Santrauka

Konkurencingumui įtakos turi daugelis aplinkybių. Neatsiejama verslo dalimi išlieka būtinybė turėti vadybos ir produktų sertifikatus, nepaisant didelių išlaidų, reikalingų jiems gauti ir palaikyti.

Tai, kad akcinėje bendrovėje (AB) „Ekranas" gaminami kineskopai nesprogsta, neskleidžia jonizuojančios spinduliuotės, yra degumui atsparūs, patvirtina iš Didžiosios Britanijos, Vokietijos, JAV, Rusijos ir kt. gauti sertifikatai. Tai – ne naujiena, kadangi šie esminiai reikalavimai, išdėstyti standartuose, egzistavo nuo pat kineskopų gamybos pradžios. Tačiau jau antri metai galioja dvi naujos Europos Sąjungos (ES) direktyvos.

Viena jų yra **WEEE** direktyva (elektros ir elektroninės įrangos atliekų tvarkymo). Lietuva privalo pasiekti, kad iki 2008 metų iš privačių namų ūkių būtų surinkta ne mažiau kaip 4 kg tokių atliekų vienam gyventojui per metus. Turės būti sukurta visa atliekų surinkimo, rūšiavimo, perdirbimo sistema. AB „Ekranas" tai paveiks netiesiogiai, tačiau nevalia užmiršti, kad po kiek laiko kineskopai taps pagrindine televizoriaus atlieka. Dalis tų atliekų tvarkymo išlaidų bus priskirta ir gamintojams.

Siekiant būsimą atleką padaryti kuo mažiau kenksmingą žmogui ir gamtai, skirta kita direktyva, vadinama **RoHS** (pavojingų junginių naudojimo apribojimo elektriniuose ir elektroniniuose prietaisuose). Šioje direktyvoje pateiktas medžiagų, kurių naudojimas apribojamas minėtuose prietaisuose, sąrašas. Tai – švinas, gyvsidabris, kadmis, heksavalentinis chromas, polibrominuoti bifenoliai (PBB) ir polibrominuoti difenilo eteriai (PBDE). Taipogi, reikia įrodyti savo vartotojams ir tikrinančioms organizacijoms – pateikti iš įvairių laboratorijų gautus sertifikatus, kad AB „Ekranas" gaminami kineskopai neturi šių medžiagų arba turi leistiną koncentraciją, taip pat turėti vadybos sistemą, pritaikytą ES direktyvų ir vartotojų reikalavimų vykdymui užtikrinti. Tai neišvengiamai padidina išlaidas, kartu didina gaminių savikainą ir mažina pelningumą, kas ypač nepageidautina globalios konkurencijos sąlygomis.

Problema ir jos aktualumas. Problema, kad Lietuvoje trūksta mokslinių tyrimų duomenų bei visaapimančios informacijos, ypač globalizacijos kontekste, apie pastaruoju metu vykstančius pasikeitimus, susijusius su gaminių kenksmingumo aplinkai mažinimo reikalavimais. Tai ypač aktualu elektros ir elektroniniams gaminiams, kadangi direktyvos RoHS reikalavimai įsigalioja nuo 2006 m. liepos 1 d.

Literatūros apžvalga. Goodman (2005) pateikia detalią direktyvos RoHS analizę. Vienas iš būdų išvengti gaminių aplinkosauginių problemų – keisti požiūrį į projektavimo ir kūrimo metodus. Yra išleisti standartai ISO/TR 14062:2002, ECMA-341. Naujesniuose šia tema darbuose (McDonough, 2002; Alastair, 2002) pateikta daug bendrojo pobūdžio praktinių rekomendacijų, teigiama, jog gaminius reikia kurti vadovaujantis principu: ne nuo „lopšio į karstą", bet nuo „lopšio į lopšį". Elektroninių atliekų tvarkymo bendrieji principai pateikti (Widmer et. al., 2005; Hilty, 2005; Schmidt, 2005; Karp, 2005).

Straipsnio tikslai ir uždaviniai. Pagrindinis tikslas – išnagrinėti ES direktyvas dėl elektros ir elektroninių gaminių kenksmingumo, akcentuojant šių direktyvų svarbą globalios konkurencijos sąlygomis. Uždaviniai:

- Išanalizuoti šiuo metu egzistuojančią griežtėjančių reikalavimų aplinką;
- apibrėžti problemas, iškylančias diegiant ES direktyvas dėl elektros ir elektroninių gaminių kenksmingumo;
- AB „Ekranas" pavyzdžiu pateikti minėtų direktyvų diegimo bei integravimo į veikiančią šiuo metu kokybės ir aplinkos vadybos sistemą rekomendacijas.

Tyrimo metodai. Problemai tirti naudojamas mokslinės literatūros, teisės aktų, internetinės informacijos šaltinių analizė ir daugiametis praktinės patirties dirbant kokybės ir aplinkos vadybos srityje apibendrinimas.

Griežtėjančių reikalavimų aplinka. Lietuvoje ES direktyva WEEE buvo įdiegta išleidžiant „Elektros ir elektroninės įrangos bei jos atliekų tvarkymo taisykles", o direktyva RoHS – papildžius higienos normą HN36:2002 „Draudžiamos ir ribojamos medžiagos". WEEE ir RoHS direktyvos skirtos visiems, kurių veikla susijusi su elektros ir elektroninės įrangos gamyba, importu, platinimu, atliekų tvarkymu. Yra išskirta 10 šios įrangos kategorijų, apimančių daugelį atskirų produktų.

Nuo 2006 m. liepos 1 d. į ES negalės pakliūti ar būti gaminami prietaisai, netenkinantys RoHS direktyvos reikalavimų. Elektros ir elektroninė įranga privalės būti paženklinta simboliu, nurodančiu atskirą šios įrangos atliekų surinkimą.

Pažymėtina, kad daugiau dėmesio aplinkosaugos problemoms Europoje pradėta skirti nuo 1976 m., kai įsigaliojo medžiagų, klasifikuojamų kaip kancerogeninės, mutageninės ar toksiškos, direktyva. Toliau iki šių dienų buvo išleista daug direktyvų, draudžiančių ir ribojančių naudoti tam tikras chemines medžiagas, jų turinčių preparatų ir gaminius, kurių pavojus žmonių sveikatai ar aplinkai įrodytas moksliniais tyrimais ir patvirtintas tarptautine praktika. Tačiau tokio poveikio, kokį patiria elektros ir elektronikos pramonė priėmus RoHS ir WEEE direktyvas, dar nėra buvę. Pagal Spiegal, 2005 „Tai gali būti tik ilgo periodo, kai aplinkosauginių reikalavimų gerokai padaugės, pradžia, ir kai biznio sėkmę elektroninių komponentų srityje labiausiai lems šių reikalavimų vykdymas". Japonija, būdama daugiamete įvairių aplinkosauginių iniciatyvų lydere, panašių teisės aktų dar neturi. JAV – tik kai kurios atskiros valstijos bando sukurti savo reikalavimus. Kinija 2005 m. rugsėjo mėn. išleido įstatymo, panašaus į RoHS, projektą.

ES Parlamente svarstoma galimybė priimti dar vieną naują reglamentą. Tai būtų vadinama REACH sistema (Registration, Evaluation and Authorization of Chemicals). Jos esmė ta, kad praktiškai visos cheminės medžiagos, pakliūnančios į ES arba joje gaminamos (daugiau negu 1 t per metus), turės būti registruojamos, įvertinamos

bei autorizuojamos. Europos Komisijos pateikta REACH sistema pakeistų dabar veikiančių ir nelabai veiksmingų daugiau kaip 40 teisės aktų. Galima prognozuoti, kad minėtos šiuo metu jau veikiančios RoHS ir WEEE direktyvos ir ruošiama REACH sistema turės didelį poveikį elektros ir elektroniniams prietaisams kurti ir gamybos technologijai, kokybės ir aplinkos vadybos sistemoms, skatins inovacijas. Visa tai pareikalaus papildomų gamintojų išlaidų.

Atlikus analizę, **išskirtos ir apibrėžtos šios pagrindinės RoHS ir WEEE direktyvų diegimo problemos:**

1. Daugumoje atvejų RoHS taikymo apimtis aiški, bet, pvz., specializuotame ar pramonės sektoriuose kyla daug abejonių dėl direktyvos taikymo reikalingumo (neapibrėžtas skirtumas tarp įrenginio, komponento ar surinkimo vieneto);
2. Šiuo metu nėra tiksliai apibrėžta „homogeninės medžiagos“ sąvoka;
3. Dar yra labai maža standartų, tinkamų draudžiamų medžiagų koncentracijai nustatyti;
4. Reiktų standarto ženklinti komponentams, kad jie neturi RoHS draudžiamų medžiagų;
5. CASCO (Atitikties įvertinimo komitetas), kurio pagrindiniai partneriai yra BIPM, IAF, IFAN, IQNet, OIML ir kiti, parengė standartą ISO/IEC 17050-1 tiekėjų atitikties deklaracijos formai nustatyti. Tačiau dar ne visi vartotojai šį standartą pripažįsta;
6. Gamintojai reikalauja metodikos, kurioje būtų pateikti būdai ir paaiškinimai, kaip atitikti RoHS direktyvą;
7. Neapibrėžta RoHS direktyvos atitikties deklaravimo tvarka. Savideklaracija, naudojama Naujojo požiūrio direktyvose, šiuo atveju tiktų, nors RoHS nėra Naujojo požiūrio direktyva;
8. Pasitikėjimas atitikties deklaracijomis ir duomenų patikimumu;
9. Atskiros firmos arba sertifikuojančios organizacijos kuria savo sistemas, pavadinimus. Gamintojams sunku prisitaikyti ir vykdyti skirtingus vartotojų reikalavimus (pvz., SAMSUNG programos „Eco Partner“, „Green Purchasing“; Texas Instruments RoHS „Gold“; kabelių sertifikavimas BASEC (Anglija) „Eco-Green“ ir daug kitų);
10. Turėtų būti sukurti RoHS informacijos tinklai koordinuoti rinkos priežiūrai visose ES šalyse;
11. Kuriamos atskirų firmų duomenų bazės internete (pvz., SAMSUNG), į kurias gamintojas (tiekėjas) privalo pateikti detalią informaciją apie savo gaminio sudedamąsias dalis, deklaracijas, matavimų protokolus, atskleisti, iš kur gautos medžiagos ir kt. Iškyla konfidencialios informacijos nutekėjimo pavojus;
12. Didelės darbų apimtys, o kartu ir papildomos išlaidos, kad visapusiškai būtų RoHS direktyvos atitiktis;
13. Kai kurios firmos iš savo tiekėjų reikalauja duomenų ne tik RoHS ir WEEE direktyvų apimtiea, bet ir prijungia asbesto, ozoną ardančių medžiagų ir kt. klausimus. Be to, kartais neapsiriboja vien gaminiu, o išsiplėčia ir į pakuotėse bei technologiniame procese naudojamas medžiagas;
14. RoHS direktyvos įgyvendinimas tiesiogiai veiks į gaminių patikimumą ir ilgaamžiškumą (pvz., atsisakius švino lydmetalyje);
15. Norint galutinai įdiegti direktyvos WEEE reikalavimus, dar reikia keisti daug teisės aktų (pvz., „Administracinių teisės pažeidimų kodeksą“);
16. Diegti WEEE direktyvą apsunkina ir taršos mokesčio elektros ir elektroninei įrangai nebuvimas;
17. Išimtys naudoti draudžiamas medžiagas, nurodytas RoHS direktyvoje, yra tik laikinos. Iki 2010 m. jos visos bus peržiūrėtos. Praktiškai elektros ir elektronikos srities pramonės dalyviams nėra kitos išeities, tik siekti visų gaminių „žalumo“.

Pateikta **ES direktyvų dėl elektros ir elektroninių gaminių kenksmingumo diegimo patirtis AB „Ekranas“.** Vadybine prasme RoHS ir WEEE sistemos palaipsniui integruojamos į šiuo metu veikiančią verslo vadybos sistemą, kurios pagrindą sudaro pagal tarptautinius standartus ISO 9001 ir ISO 14001 sukurta ir įdiegta kokybės ir aplinkos vadybos sistema (K ir AVS). Kokybės valdymo metodų integravimo principai (Vaišvila, 2005), išbandyti ilgametėje praktikoje, gerai tinka ir šiuo atveju. Lentelėje pateikta informacija apie RoHS ir WEEE sistemų integravimą į veikiančią K ir AVS. Remiantis Goodman (2005) rekomendacijomis, AB „Ekranas“ sudarytas ir praktiškai naudojamas komponento ar medžiagos RoHS direktyvos atitikties įvertinimo sprendimų medis. Jo pavyzdys pateiktas paveiksle.

Išvados

1. Prognozuojama, kad RoHS ir WEEE atitikties deklaravimo ir palaikymo išlaidos bus didesnės negu tradicinėse saugos (produkto ir aplinkos) užtikrinimo sistemose. Papildomas privalumas – sertifikuotos aplinkos vadybos sistemos pagal ISO 14001 turėjimas;
2. RoHS ir WEEE sistemų diegimo patirtis dar kartą patvirtina, kad vadybos metodų ir sistemų integracijos tendencija yra neišvengiama, o sritys, kurias apima ši integracija, nuolat plečiasi;
3. RoHS ir WEEE direktyvų pasirodymas – tai tik ilgo laikotarpio pradžia, kai aplinkosauginių reikalavimų daugės, o jų vykdymas daugiausia lems elektros ir elektroninių gaminių vystymosi tendencijas ateityje, ypač globalinės konkurencijos sąlygomis.

Raktažodžiai: *elektros ir elektroniniai gaminiai, pavojingos medžiagos, atliekų valdymas, išlaidos, kokybės ir aplinkos vadybos sistemos, integracija.*

The article has been reviewed.

Received in February, 2006; accepted in June, 2006.

DOI: 10.5755/j01.ee.48.3.11369