The Setup of Packaging Development Targeted at Source Reduction and Environmental Regulatory Compliance

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Permanent growth of packaging waste has a negative environmental effect. Therefore, volume and content of packaging are being regulated by relevant legislation. In 1994, the European Union (EU) adopted the Directive on Packaging and Packaging Waste (94/62/EC) (subsequently – the Directive), which set the environmental requirements for packaging but did not precisely specify the methods of their implementation. The related harmonised standards EN 13427-13432 partly filled in the gap, but a number of questions have been still left without due explanations. The EU countries were supposed to develop their own legislation, which should have been complemented with the elements that have not been elaborated on the EU level. This task appeared to be complicated for many countries for various reasons, including economic. The cost of implementation of the Directive can be high for a country, especially if it is not done carefully. As a result, the state of implementation of the Directive by the EU countries remains non-uniform. Only a few countries have fully implemented it, while others have just transferred the requirements into their own legislation, but have not implemented the obligatory enforcement measures. A big variety of packaging source reduction policies exist in the EU, which have been developed by the Member States trying to fit them to the country's situation in terms of legislation, institutional infrastructure, conduct of the industry, etc. For this reason, their transfer from one country to another is problematic. Therefore, this study aims to develop a cost-efficient structure of the packaging development process to be applied by both the industry and state enforcement institutions and to fit into the context typical for Lithuania.

Keywords: *setup of the packaging development process, prevention, source reduction, essential requirements, regulatory compliance, circular economy.*

Introduction

Permanently growing volume of packaging waste has a negative environmental impact visible worldwide. Non-recovered waste disposed to landfills occupies valuable land, contaminates soil, groundwater and air, while waste entering seas and oceans negatively affects their flora and fauna and creates long-lasting problems, which are difficult to control. The phenomenon called 'plastic soup' is one of the problems that has found no solution so far. Plastics do not biodegrade in the ocean water naturally but break down into even smaller pieces. Accumulated in the ocean, particles cause harm to sea fauna and, finally, to people after entering the food chain.

To tackle these problems, the European Union (EU) has adopted special legislation to regulate the conduct of manufacturers and importers who supply packaging and packed goods to the EU market. The core document establishing the main principles and requirements, which manufacturers and importers have to follow, as well as performance indicators for the EU Member States was the European Parliament and Council Directive on Packaging and Packaging Waste (94/62/EC) (subsequently – the Directive), adopted in 1994. Later, in 2000–2002, the Directive was supplemented with a set of harmonised standards EN 13427-13432, representing a methodological base for procedures performed under the Directive. The harmonised standards have clarified many aspects related to the implementation of the Directive on both the company and the country-wide levels. Nevertheless, a number of questions, especially those related to optimisation methods of weight and volume of packaging and verification of compliance with essential requirements, have still remained unclear and should have been clarified through adoption of the EU Member States' own legislations, establishing and describing the procedures to be followed in order to comply with the Directive. Partly because of this reason, the state of implementation of the Directive remains very mixed across the EU Member States despite more than 20 years since the adoption of the Directive. Very few countries have implemented comprehensive national enforcement systems to supervise packaging and warrant its conformity with essential requirements. It is important for efficient supervision and enforcement that the requirements be uniformly understood and treated by both business entities and supervisors. To solve this problem, some countries, e.g. the United Kingdom, France and Nordic countries (Finland, Iceland, Norway, Sweden and Denmark), have developed national guidelines or methodologies parallel to adjustment of national legislations. Even though the guidelines target the same essential requirements set by the Directive, the meaning of compliance and its assessment is interpreted in a slightly different way in various countries. Furthermore, the above guidelines and the implemented supervision/enforcement systems have been developed to best fit the country's packaging material data collection, reporting systems and especially the existing institutional infrastructure. Therefore, they differ in each country and it might not be optimal to simply apply them without due adjustment in another country. This study analyses the information and experience within packaging source reduction and implementation of the Directive in the EU countries and the possibility to explore it for developing the principles of packaging design and assessment of compliance in Lithuania.

The aim of this paper is to present a setup of packaging development based on waste prevention-oriented source reduction principles and compliant with environmental requirements set by relevant regulations, which could also potentially serve as a base for compliance testing of packaging by the state enforcement institutions.

Research methods used in this study comprise the following: review of models, methods and tools applicable to packaging minimisation performed by using comparative, logical and systemic analysis; synthesis, generalisation and critical analysis methods used for structuring the packaging development process; and case study analysis used to test the offered setup.

Current state and issues of source reduction and principles of extended producers' responsibility within packaging and implementation of Directive 94/62/EC

Source reduction of packaging is understood as efforts aimed at reducing its volume, mass, or toxicity through-

out the life cycle. It covers the design, manufacture, use, and disposal of packaging with minimum toxic content and minimum volume of material. In general, the state of packaging source reduction in the EU is closely interrelated with implementation of the EU Directive on packaging and packaging waste. Issues related to its implementation have been in focus of both the industry, authorities and researchers for several decades (European Commission, Europen, Pira, Optipack, Arcadis, Sluisved et al., Steffens et al.). For example, the follow-up on the progress in various EU countries has been regularly performed by the European Commission (EC) [European commission. Environment], various associations, such as EUROPEN, and consulting companies, such as ARCADIS, PIRA, etc. They have revealed a very mixed picture characterised by a non-uniform state of development in various countries. While requirements of the Directive have been relatively smoothly transferred into the legislation of all the EU countries, only a few of them have established national packaging enforcement systems (Arcadis, 2009) to supervise the packaging and warrant its conformity with essential requirements of the Directive. It became clear at the very beginning of the implementation of the Directive that fulfilment of requirements would constitute additional burden for the industry in terms of incurred resources (Prendergast, 2006). Furthermore, the supervision and enforcement systems can be efficient only if packaging requirements are uniformly understood and treated by both business entities and supervisors; therefore, some countries, such as the United Kingdom, France and Nordic countries (Finland, Iceland, Norway, Sweden and Denmark) (Optipack, 2005) parallel to adoption of the Directive have developed national guidelines to solve this problem. The main aim of the guidelines was to specify the requirements and necessary actions, which business entities should perform in order to demonstrate that they act in accordance with the Directive and if the scope of actions performed by them is sufficient to prove the adequacy and confirm the compliance of packaging.

The reports of the research initiated by the EU have stated that Directive 94/62/EC has succeeded in '… pushing the rates for recycling and recovery of packaging waste, including the energy recovery, above the targets set for 2001 …' (Commission, 2006). Although the aggregate tonnages of packaging waste have been still increas-

ing in most Member States as a result of economic growth, the growth in volume '… was decoupled from economic growth …' (Commission, 2006), which was a significant achievement compared with the situation before the Directive. The reports have admitted that '… there is a large gap between the Member States and the industry with regard to implementation and compliance of packaging with the Essential Requirements. The industry is very much in favour of the Essential Requirements. However, for the industry, the most important effect of the Essential Requirements is not the reduction of packaging (waste), but the free movement of packaging. They regret that so few Member States enforce implementation of the Essential Requirements. The authorities, on the other hand, show little interest in enforcing the Essential Requirements. They leave it to the industry to comply. Arguments are other priorities (e.g. food safety), lack of staff and finances, and lack of understanding on how to assess compliance with the Essential Requirements …" (Arcadis, 2009).

The year 2006 Report from the EC Commission (Report, 2006) admits the limited success of all prevention measures undertaken so far and debates their efficacy. The Report states that any more substantial changes in volumes of packaging placed on the market can only be achieved through changes in production, consumption and distribution patterns. This is reflected in the limited success of all prevention measures undertaken so far. Although there seems to be some decoupling of packaging waste generation from GDP growth, in almost all the Member States the absolute quantity of packaging waste is increasing. Prevention measures such as enforcement systems for the essential requirements, packaging prevention plans and strong producer responsibility systems might have had some effect on the reduction of packaging generation. However, the overall patterns of packaging waste generation are not significantly different between the Member States applying different prevention tools and the Member States applying none of these tools (Report, 2006).

Packaging volume minimisation has become the most discussed issue related to implementation of the Directive. The European organization for packaging and the environment (EUROPEN) has noted (EUROPEN, 2006) that proof of minimisation has been problematic and pointed on some indirect ways of proof as more relevant. However, it is true that the issue that has received

most attention, i.e. the avoidance of over-packaging, can only be tested by ensuring that the producer has set up and operated a system to ensure that he asks himself all the right questions and that he has documented the answers. The enforcement authorities verify compliance with the prevention standard by asking the producer to demonstrate the steps that have been taken to identify the 'critical area' that prevents further source reduction. If this cannot be done, the packaging fails the standard (EUROPEN, 2006). This brings an idea that straightforward proof of minimisation of every package could be replaced by demonstration that the result of minimisation has been achieved by applying the right procedures, meaning that application of the right minimisation procedures could justify the result. This note is of high value as it opens the possibility to influence the cost of implementation of the Directive and the related financial burden for the industry and the EU Member State authorities through implementation of various alternative approaches to development and assessment of packaging.

The cost of implementation of the Directive and distribution of financial burden has been discussed since the very beginning of its implementation. Attention was paid to the fact that '... firms which comply with the requirements of the directive will be at a cost-disadvantage compared to those who do not.' (Prendergast). In contrast, the Optipack (2005) encourages companies to see material minimisation as a means for achieving economic superiority in business competition. Although the latter statement does not have a clear confirmation in the literature, the Optipack idea of integration of source reduction measures with quality management and other systems already operated in companies supports it as this might significantly reduce its total cost.

The Directive and harmonised standards require that weight and volume of packaging be minimised and the corresponding proof provided based on research and testing, but do not precisely specify the methods to be used (EN 13428:2004). Therefore, companies and authorities responsible for enforcement are free to improvise to a certain extent, but at the same time it brings uncertainty related to whether the performance of companies is compliant with the requirements as well as

the requirements themselves are formulated correctly by enforcement authorities. This legislative gap has resulted in emergence of a number of packaging development methods, which fill-in the above gap and try to justify the compliance of packaging:
_ Life cycle assessment (Staniškis et al., 2010);
_ Eco-design of packaging (CNE, 2012, Staniškis et al., 2005);
_ The European Parliament has introduced the Packaging Environmental Indicator (PEI), a conceptual tool, which 'measures the environmental impact of packaging and produces a simple result allowing to improve packaging and facilitate the selection between different packaging systems' (Report to the Council, 2006). Nevertheless, this approach has not been accepted by the Directive and/or the harmonised standards as an imperative tool.

Alternative means are also used to achieve the prevention of packaging and packaging waste (Arcadis, 2009):
_ Information and awareness through contests and awards, pilot projects, awareness raising campaigns, etc.
_ Fiscal measures: tax on products in function of the weight and recyclability of the packaging; for reusable packaging the tax has to be paid only once.

Some countries have implemented specific regulations, such as:
_ Prevention plans: in Belgium and Spain, companies which put (import) large amounts of packaging on the market need to report their prevention efforts. A prevention plan comprises reduction objectives and the measures to achieve these objectives. They need to be approved by authorities.
_ Obligation to produce reusable packaging: in the Czech Republic, trading premises larger than 200 square metres are obliged to offer beverages in reusable packaging if they exist on the market. In Portugal, all distributors/retailers selling soft drinks, beer, natural mineral water, spring water or other bottled water and table wines in nonreusable packaging must also sell the same category of product in reusable packaging to provide consumer choice.

Other measures include:

_ deposit systems (Denmark, Germany, the Netherlands);
_ voluntary prevention plans (Hungary, Italy, UK);
_ formalised cooperation with the industry (Denmark).

A huge variety of approaches to source reduction determine that related policies in various countries differ significantly.

A fundamental OPTI-PACK project (Optipack, 2005) implemented jointly by 5 Nordic countries has focused on practical implementation issues of the Directive strictly within the framework of its formulations. The guidelines developed under this project attempt to describe the steps of assessment based on the process approach applied by the ISO 9000-series standard. Furthermore, the various assessment processes are described individually for different parties in the distribution chain in order to clarify who does what in the assessment.

Such diversity in approaches and policies, which are subject to different contexts and infrastructures in various countries, makes it problematic to adopt them in other countries without due adjustment. This study seeks to develop a cost-efficient structure of the packaging development process, which would guarantee the packaging minimisation result sufficient to justify its compliance with the essential requirements and would be applicable to both companies and enforcement institutions.

Structure of the packaging development process: economic efficiency and link with regulatory compliance of packaging

Efficiency of measures implemented by the EU Member States within source reduction of packaging depends on cost-benefits balance (Levy, 2000), where cost of measures implemented are estimated in comparison with the environmental advantages/effect generated by them. Figure 1 illustrates this balance and shows that aggregate cost function contains extrema (minimum aggregate cost), meaning that optimal balance between the above measures and the environmental effect needs to be found; otherwise, efficiency of undertaken measures will be low or even detrimental.

Traditionally, a fundamental approach to packaging development has been based on the need to satisfy a set of requirements related to packaging functionality, product safety, reliability and customer acceptance. Packaging has to be acceptable from the point of view of handling and logistics. It also has to be acceptable to customers and provide them with necessary information. Business logic requires that these targets be achieved at a minimal cost. Introduction of additional (environmental)
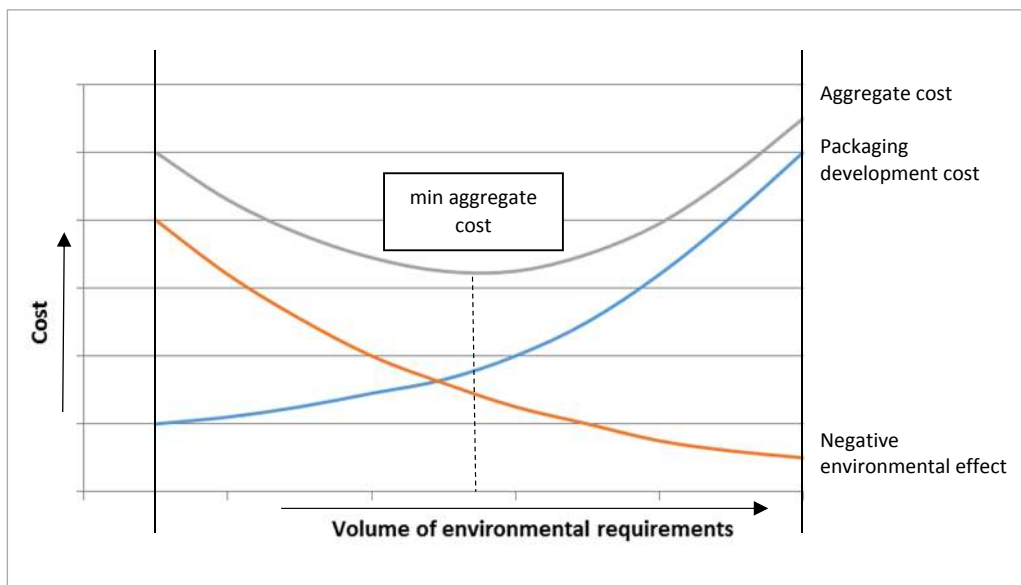

Fig. 1

The balance of packaging development cost (Levy, 2000)

requirements changes the picture as widens the range of traditional requirements. More efforts should be put to meet them, more resources used and, consequently, the related cost increases. The stricter the environmental requirements, the higher the cost of their implementation. This applies to both the packaging development stage and enforcement. At early stages of packaging development, manufacturers bear the increased cost, but later it turns into higher production cost and, finally, into a higher price of the product. The value of reduced material shall compensate the increased production cost, but the main expected result from these requirements is the effect from reduced negative environmental impact. The trends displayed in Figure 1 show that the cost of fulfilling ever increasing requirements tends to rise at an increasing rate, while a positive environmental effect from them diminishes. Therefore, it is important that the volume of the requirements be optimal from the point of view of cost and benefit as any shift from the optimal zone shall mean higher cost of production and reduced competitive capacity of manufacturers on the global market. From this point of view, the cost of implementation of source reduction measures is as important as the volume of environmental requirements. Cost-efficient ways of their implementation could have a positive effect on economic performance of businesses as well as on the environment.

Packaging development and design model

The packaging development-related cost strongly depends on the structure of its development process. The highest cost is typical for processes, which are only once performed for development of one-time-design packaging, not intended for further upgrading or improvement. The gathered information in such a case is used only once and gives no possibility to accumulate and use it repeatedly and, thus, save. So is with the enforcement: if assessment is performed once and there is no possibility to quickly estimate the compliance of packaging, e.g. by using cost-efficient benchmarking tools, the cost is high, especially if it is performed by using laboratory methods. In contrast, the development process, which

rests on previous experience and the accumulated information, can be considered as an alternative cost-saving approach and potentially beneficial for packers and state enforcement institutions. Long-term, gradually and continuously upgraded information on various types of packaging developed by the company could serve for implementation of such an approach. The packaging development and design model displayed in Figure 2 represents one of the possibilities, which if applied by the industry should guarantee overall compliance with the essential requirements of Directive 94/62/EC and harmonised standards EN 13427-13432 and could serve at the same time as a cost-saving and pollution-preventive tool for compliance testing of packaging.

Another precondition of successful development of packaging is the consideration of the entire packaging supply chain. It is a rather complicated process because in each stage of the supply chain there might be different requirements and conditions that have to be combined. Strategic and tactical functions of packaging, logistics, the level of damage to packed products, graphic design and printing technologies are detailed in the packaging chain. There are many players and connections in the packaging supply chain, the requirements and regulations for packaging management and related information are not always clear, there are many uncertainties. The packaging supply chain is inextricably linked with the product supply chain, where there are more players, connections and requirements. The entire packaging life cycle should be also considered in terms of the environmental impact of packaging, and solutions to reduce the adverse effect of the packaging system should be sought.

The compliance of packaging with the current regulations is a prerequisite regardless of the nature of the tool used and the objectives pursued by the company in the framework of its global strategy.

Current regulations should not only be understood as the regulations mentioned in this frame of reference for eco-design but also as every regulation establishing the neutrality of the packaging towards its contents.

The selection of a relevant helping tool remains the company's decision; there is a list of a few criteria that would enable strengthening of the results and that cannot be ignored:
– compliance with the current regulations/ legislation;

_ based on the product/packaging pairing;

_ assessment of the whole packaging system;

_ a multi-step and multi-criteria approach to the analysis of the entire life cycle of the product.

The eco-design of packaging fits into the multi-criteria analysis of the entire life cycle of the product and packaging. The company can assess the environmental impacts of the product and its packaging and start implementing action plans according to the following continuous improvement circle (Fig. 2). This iterative process applies to the makeover of packaged products as well as part of an innovation approach. The packaging development and design model based on the integration of a systemic approach and analysis of the main functional criteria can be successfully applied in practice in order to find effective and fast enough packaging development, design and improvement solutions. The product and packaging concept may be further evaluated and developed in environmental terms by doing a life-cycle analysis. Further development, however, would involve additional time costs. Therefore, the packaging developing model may be improved by

integrating the most important environmental aspects into earlier design stages, e.g. the analysis stage. For instance, the possibilities to reuse or recycle the packaging can be evaluated in the stage of selection of packaging material.

As it has been mentioned earlier, the main packaging functions, which are the starting point for packaging design, are product protection, distribution/transportation and communication. Product protection is still the main function. In the design process of packaging, the ideas for product protection are generated first, and their compatibility with the set goals is checked. The ideas of the first design cycle are further developed and analysed, and solutions for the distribution system and information are added. The solutions and ideas are evaluated against the set goals and criteria until the final product and packaging concept are developed.

The setup is structured in a way to fully comply with the procedures set by the harmonised standard EN 13428. It includes the analysis of various stages of the life cycle of packaging and their relevance to packaging minimisation decisions. The main feature specific to this setup
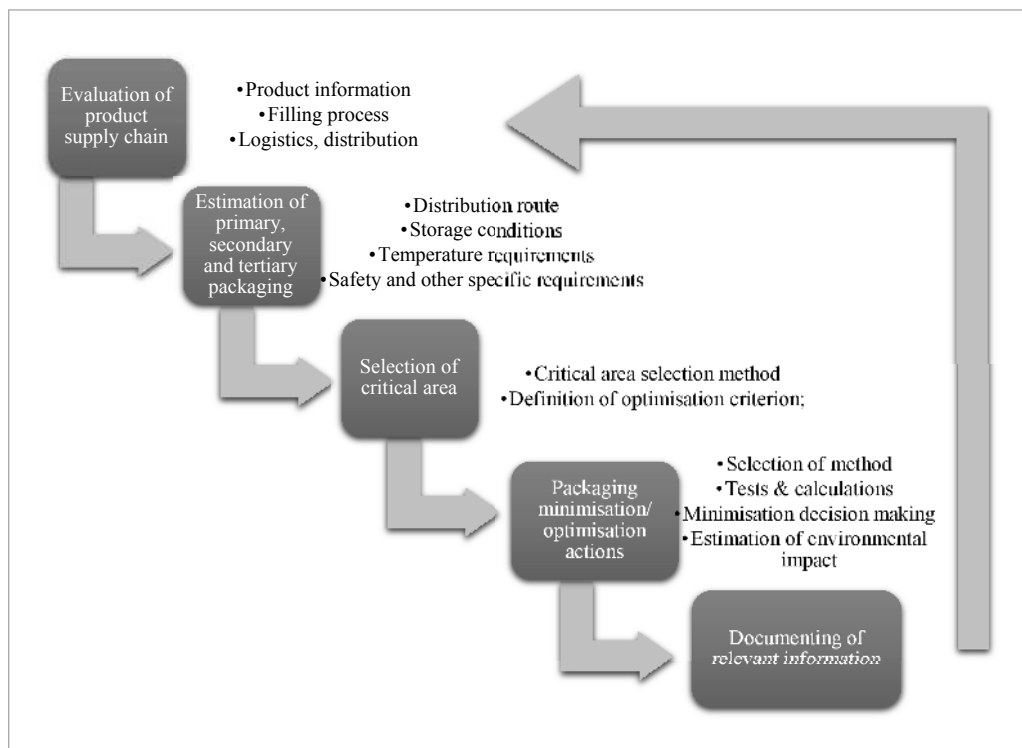

Fig. 2

Setup of the packaging development model applicable to industry and supervising bodies

is its circular character due to the introduced link joining the end of the development process with its starting point. This turns packaging optimisation into a continuous spiral process, where development of every new packaging system/package or their modification starts in the company not from zero, but is based on previously accumulated information and the experience from using packaging systems, which are or have been in use. Possession of such information enables the company to significantly reduce the development cost of new packaging by avoiding potential design mistakes and the need to apply risk-reducing measures, such as excessive use of material. This also reduces the volume of design work as previous experience is exploited. This approach sets certain excess requirements to companies compared with the standard EN 13428, but in reality it solves a number of additional problems, which are definitely beneficial as they have a significant saving effect.

Case study-based efficiency analysis of the circular packaging development model

A case study analysis was performed to demonstrate the controversy that may arise from application of oth-

erwise objective, quantitative laboratory methods for decision-making related to source reduction of packaging.

A packaging system used by the company that manufactures thermal insulation blocks from polystyrene foam was analysed. The company uses LDPE film sleeve to fix 500x500x1000 mm blocks of production to ease logistics, prevent scatter and partially protect from mechanical damage. The packaging system is rather simple and minimisation of packaging seems to be very simple as well. The company intended to minimise the amount (weight) of LDPE film according to EN 13428 standard, based on the information from stress-strain testing of LDPE film performed according to standard ISO 527-1 *Plastics – Determination of tensile properties*. Films within the thickness range from 30 μm to 70 μm were tested. It was expected that the stress-strain data displayed on Figure 3 should be sufficient to select the proper thickness of the film for the product, the weight of which per package was well known. The film thickness selection criterion was that product load should not cause elastic deformations of the package. This limit is marked in Figure 3 with a vertical (black) line. The package weight makes 8 kg or ~ 80 N. As package length is 100 cm, the estimated static load per 1 cm is 0.8 N/cm. A 30 μm film should withstand this load with the reserve close to 2 ≈ (1.6 N / 0.8 N), which seemed

Fig. 3

Stress-strain curves of LDPE film within the 30–70 μm thickness range
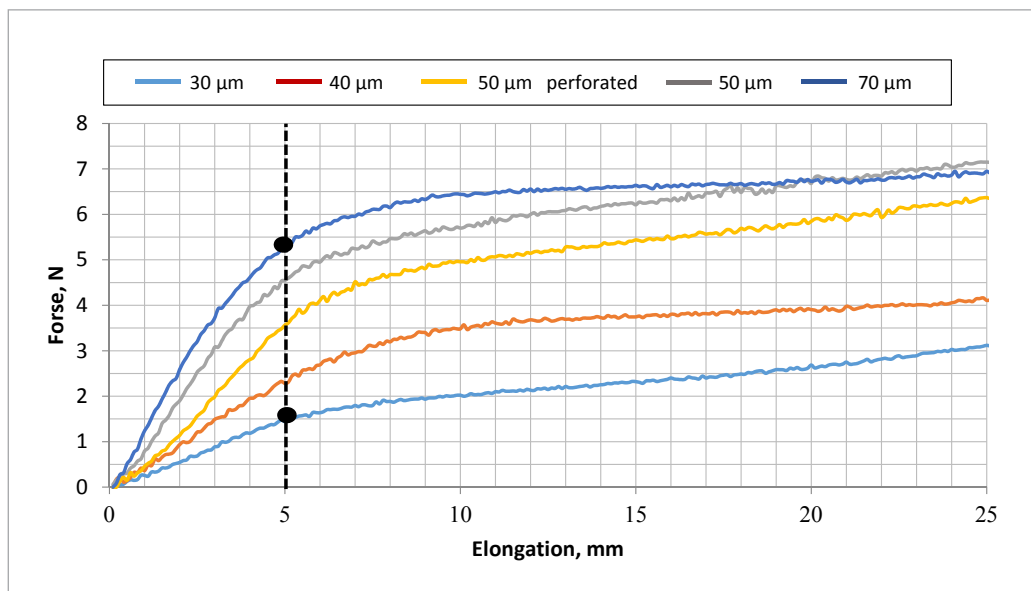
to be sufficient according to preliminary expectations of company specialists. Test packages from 30 μm LDPE sleeve were produced, but packages from 40 μm LDPE sleeve were also produced to compare the performance. Company clients were asked to send their feedbacks with estimation of the quality of production delivered to their sites. The comparison of responses produced the result showing that the level of claims related to 30 μm packages was approximately 8%, while only 2% related to 40 μm packages. The final decision made by the company was that heavier (40 μm) packaging should be used even though the laboratory test results indicated that a 30 μm film should be acceptable.

This also shows that laboratory methods alone, even though they are quantitative and otherwise objective, cannot provide sufficiently reliable information for decision-making related to choosing optimal parameters of packaging. They have to be combined with other test methods, which reproduce real conditions in the transportation route from manufacturer to final customer. The setup of the packaging development process offered in this paper does not exclude the use of laboratory methods but leaves no space for decisions that are not reliably tested.

Summary and conclusions

1 Permanent growth of packaging waste worldwide has a negative environmental effect. Therefore, volume and content of packaging are being regulated by relevant legislation. The legislative framework in the European Union comprises the Directive on Packaging and Packaging Waste (94/62/EC) and related harmonised standards EN 13427-EN 13432. While the Directive establishes the main principles of packaging development and key performance indicators for EU Member States, the harmonised standards can be considered as a methodological tool to be used by both business entities and state supervision institutions. Nevertheless, a number of requirements in the standards are formulated in general terms, the methods of their implementation and assessment are not precisely specified.

2 The EU countries have been supposed to further develop their own legislations, which should have been complemented with the elements that have not been elaborated on the EU level. The task appeared to be complicated for many countries for various reasons, including economic. The cost of implementation of the Directive can be high for a country, especially if the implementation process is not done carefully. As a result, the state of implementation of the Directive by the EU countries remains extremely non-uniform. Only a few countries have fully implemented it, while others have just transferred the requirements into their own legislation but have not implemented the enforcement measures, which are obligatory.

3 A big variety of packaging source reduction policies exist in the EU, which were developed by the Member States trying to fit them to the country's situation in terms of legislation, institutional infrastructure, conduct of the industry, etc. For this reason, their transfer from one country to another is problematic.

4 A setup of the packaging development process and the structure thereof, which could be applied by both the industry and state enforcement institutions, were developed in the study. The development process is structured in a way to ensure that the packaging being developed meets the essential requirements set by the Directive. Furthermore, special attention was paid to achieve the maximum cost efficiency and fit into the context typical for Lithuania in terms of institutional infrastructure (supervision and enforcement), features of the industry and its attitude.

5 The eco-design of packaging fits into the multi-criteria analysis of the entire life cycle of the product and packaging. The company can assess the environmental impacts of the product and its packaging and start implementing action plans according to the following continuous improvement circle. The introduced packaging development and design model based on the integration of a systemic approach and analysis of the main functional criteria can be successfully applied in practice in order to find effective and fast enough packaging development, design and improvement solutions.

6 The case study performed to analyse the efficiency of the suggested setup of packaging development showed that it either could be used alone or could be combined with quantitative laboratory methods to increase the reliability of packaging development results.

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Į išteklių mažinimą ir atitiktį aplinkosauginiams reikalavimams orientuota pakuočių projektavimo sistema

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Pakuočių atliekų kiekio didėjimas ir jų neigiama įtaka aplinkai yra problema, kurios sprendimui pasaulio šalys imasi įvairių priemonių. 1994 metais buvo priimta Europos Parlamento ir Tarybos direktyva 94/62/ EB dėl pakuočių ir pakuočių atliekų, nustatanti griežtus reikalavimus į rinką išleidžiamoms pakuotėms. Remiantis šiuo pirminiu dokumentu toliau plėtojama teisės aktų sistema, į kurią įeina ir darnieji Europos standartai EN 13427- EN 1432. Ją įgyvendindamos visos ES valstybės narės susiduria su problema, kad minėtuose teisės aktuose yra reglamentuojami pakuočių atliekų tvarkymo proceso tikslai ir pagrindiniai principai, o tų tikslų siekimo kelius ir sistemas valstybės atitinkamose ribose turi išplėtoti pačios, atsižvelgdamos į savo ūkio sistemų ypatumus.

Straipsnyje apžvelgti pagrindiniai sprendimai, kuriuos įvairios ES valstybės pasirenka, kad būtų pasiekti minėtoje ES aplinkosauginių nuostatų sistemoje keliami privalomi tikslai, kartu racionaliai suderinant aplinkosauginius ir ekonominius aspektus. Konstatuota, kad yra didelė įvairovė naudojamų variantų, kurios tiesiogiai taikyti Lietuvoje dėl ūkio specifikos nebūtų racionalu. Straipsnyje pateikti pavyzdžiai, įrodantys, kad pakuočių optimizavimui ne visada pakanka taikyti įprastinius laboratorinius tyrimus, todėl daugeliu atvejų yra reikalingi originalūs pakuočių poveikio aplinkai įvertinimo metodai. Išanalizavus kylančias problemas bei galimus sprendimus, susijusius su Lietuvos ūkio sistemos ypatumais, darbe suformuoti žiedinės ekonomikos koncepcija ir proceso sistemiškumu grindžiami pakuočių kūrimo ir jų aplinkosauginio veiksmingumo įvertinimo principai. Siūloma pakuočių kūrimo ir patikros sistema skatintų ekologiškų pakuočių kūrimą ir naudojimą, tuo prisidedant prie griežtėjančių ES aplinkosauginių reikalavimų pakavimo sektoriui vykdymo tiek dabartiniame etape, tiek ir ateityje.