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**METHODS INCREASING THE COMPETITIVENESS OF  
ENTREPRENEURIAL STRUCTURES IN A CIRCULAR  
ECONOMY**

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**Abstract**

The study considered the methods increasing the competitiveness of small and medium-sized enterprises in the field of recycling of secondary polymer materials, which are using innovative closed-cycle technologies. The essence, principles and conceptual provisions of a circular economy in modern conditions are formulated, the possibility of using various groups of polymers as materials promising for the creation of closed cycles is studied. The fundamental differences between a circular economy and a linear economy, and the key conditions for the application and implementation of closed value-added chains in a circular economic system are studied. The main methods increasing the competitiveness of enterprises in the field of recycling and their products are highlighted. The main and supporting processes of the value-added chain of small and medium-sized enterprises in the field of polymer recycling, which determine the competitiveness of these enterprises and their products, are considered. The formation of the competitive advantage of small and medium-sized enterprises and their products in the field of recycling of polymers through the rational main and supporting processes of the value-added chain is described. The process of commodity circulation of secondary polymer materials in a linear and circular economic model are analyzed from the point of view of the impact on the competitive potential of small and medium-sized enterprises that recycle polymers. The reorganization of commodity circulation of secondary raw materials and correction of the value-added chain for products of small and medium enterprises in the field of polymer recycling are proposed.

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## 1. Introduction

The exponentially growing accumulated waste of civilization has turned into a global problem of mankind and poses a direct threat to the life and health of the population of most countries for more than a dozen years. The transition from traditional landfill disposal and incineration to industrial processing is an integral part of the concept of sustainable development and a modern trend in solving environmental problems in the field of waste and resource conservation. Small and medium-sized businesses have long played an active role in processing polymer waste. The entrepreneurial potential of small and medium-sized recycling enterprises is formed by innovative recycling technologies, as well as by the efficient value-added chain. Small and medium-sized enterprises, processing polymers in the form of raw materials and recyclable waste within the framework of a linear economic model with its principle of “extracted - produced - consumed - thrown away”, process only a small fraction of polymers because of ineffective commodity circulation of secondary material resources and disunity of chain participants supplies at all stages of commodity circulation.

At present, due to the growing environmental stress caused by accumulated polymer waste, resource conservation policy and considerations of economic prospects to recycle secondary polymers, it is necessary to use an alternative, circular economy, the fundamental principles of which are “take-produce-reuse” (Trofimova et al., 2018). The closed cycle, on which the ideas of a circular economy are based, is a resource loop, where incoming raw materials in the production process pass into goods that are used for their intended purpose until they lose their consumer properties and usefulness, and their further utilization by processing their raw fractions to return re-isolated raw materials to the production cycle of the same product.

A circular economy involves the creation of closed technological cycles that imitate ecosystems, where there is no waste, and all elements are interconnected and codependent (Abezin & Anisimov, 2018; Gureva & Butko, 2019; Nikitina, 2020, 2021). Therefore, small and medium-sized recycling enterprises operating on principles of a circular economy have competitive advantages in segments of occupied markets, which determine the methods increasing the competitiveness of both enterprises and their products. The main methods increasing the competitiveness of enterprises in the field of recycling and their products are:

1. Effective product distribution process;
2. Reduction of specific energy consumption during recycling of secondary waste;
3. Reduction of the specific environmental impact when recycled materials are returned to the cycle;
4. Rational organization of the most important main and supporting processes for creating a value-added chain.

The organization of an effective product distribution process creates conditions for creating a value-added chain, which is the sequence of creating the final value of products. The most important condition for the use and implementation of closed value-added chains in a circular economic system is a decrease in specific energy consumption and specific environmental impact when recycled materials are returned to the cycle compared to the use of primary raw materials (Dirko, 2019). The rational organization of the most important main and supporting processes for creating a value-added chain determines the final cost and value of manufactured products, providing an enterprise with a competitive advantage.

## **2. Problem Statement**

How to improve the competitiveness of small and medium-sized enterprises for recycling polymer waste and their products? Can all secondary polymers be involved in recycling technologies? What is the economic feasibility of their processing? What are the criteria for using recycled materials by small and medium-sized enterprises? What are the differences between the principles of a traditional linear economy of polymer processing and a cyclical one? What are the key areas for increasing the competitiveness of small and medium-sized recycling enterprises? How can they be implemented by small and medium-sized enterprises processing secondary polymers?

## **3. Research Questions**

Research aimed to improve the competitiveness of entrepreneurial structures should start with the features of the circular economy and conditions for the use and implementation of closed value chains in the circular economic system. Further, to determine the main and supporting processes of the value chain formation of small and medium-sized enterprises in the field of recycling of polymer materials. This will reveal the competitive advantage of small and medium-sized enterprises in the field of polymer recycling, as well as determine the further research, which is to analyze commodity circulation of secondary polymer materials in the linear and circular economic model. Further, to determine how the process of commodity circulation affects the competitive potential of small and medium-sized enterprises that recycle polymers. For this, it is necessary to give a comparative characteristic of commodity circulation of secondary polymers within the framework of the analyzed economic systems: linear and circular. This will reveal the ways of reorganizing the process of commodity circulation and the processes of forming the added value of the products of enterprises for the processing of secondary polymers. As a result, we can increase the competitiveness of entrepreneurial structures in the circular economy.

## **4. Purpose of the Study**

A circular economy is to solve the problem of creating a closed cycle without waste, as close as possible to the cycles of the biosphere with “zero” waste. To solve the set tasks, it is necessary to highlight the priority materials that are most preferable for use in industrial production and methods increasing the competitiveness of enterprises in the field of recycling. The purpose of the study is to identify and assess the methods increasing the competitiveness of entrepreneurial structures engaged in recycling in a circular economy. For the potential large-scale application of polymers as materials of the “future”, it is necessary to understand what determines the competitiveness of recycling enterprises and their products, as well as what areas exist for realizing the competitive potential of enterprises in the field of recycling. In contrast to a linear economy, a circular economy gives answers to the questions: what to do with polymers after their primary use and how to properly organize commodity circulation of secondary polymeric materials to maximize their processing. The identification of the main and supporting processes in the value-added chain of small and medium-sized enterprises in the field of recycling and the basics of organizing commodity circulation of secondary polymer materials in linear and circular economies as a purpose of the study make it possible to identify the necessary reorganization changes for the transition to a new model of a closed

cycle, in which enterprises - processors have sufficient potential to increase the competitiveness of products and their positions in the market.

## 5. Research Methods

Key research methods include:

- the method of complex analysis, which made it possible to study a few issues of increasing the competitiveness of small and medium-sized enterprises recycling secondary polymer in linear and circular economies;

- the method of system analysis, which allows to study the relationship and interdependence of factors of increasing the competitiveness of small and medium-sized recycling enterprises;

- the concept of rational behavior of market entities, the principles of which made it possible to perform a comparative characteristic of recycling enterprises on principles of linear and cyclical economies and to identify methods increasing their competitiveness.

## 6. Findings

From the point of view of the concept of a circular economy, polymeric materials meet the specific energy consumption requirements to produce secondary granulate. According to various estimates, the share of energy consumption in producing one ton of recycled material from the level of energy consumption in producing primary plastics is 10-15%. Table 1 shows the share of energy consumption in producing one ton of recycled material from the level of energy consumption in producing virgin materials.

**Table 1.** The share of energy consumption in producing one ton of recycled material from the level of energy consumption in producing primary materials, %

Materials	The share of energy consumption in producing one ton of recycled material,%
Aluminum	5
Plastic	10
Copper	15
Lead	40
Zinc	40
Steel	45
Paper	60
Glass	65

Source: authors based on RUPEC (2017).

The most promising for recycling in terms of the concept of a circular economy, for small and medium-sized enterprises are aluminum, plastic and copper. Reducing specific energy consumption and specific environmental impact when recycled materials are returned to the cycle ensures cost savings and increases the value of products of small and medium-sized enterprises. When creating a value chain, each process included in its structure represents the value that is included in the cost. However, in producing final products from recycled polymers, the value should be understood not only in the classical economic sense, which is embedded in the margin, but rather as a social value that increases the value of products in eyes of consumers of small and medium-sized enterprises in terms of environmental priorities. Thus, the

competitiveness of products of enterprises processing secondary polymers in a circular economy increases significantly relative to enterprises using primary raw materials.

The most demanded polymers from the point of view of closing the cycles are polyethylene terephthalate and polystyrene, which is explained by their ability to be recycled for the same or similar use, as well as due to low energy and water consumption relative to primary raw materials.

Polyolefins (low-pressure polyethylene, high-pressure polyethylene, polypropylene), which are present in products in the form of mixtures of various types, brands and colors, are the most difficult to close the cycles. Because of mixing various polymers, processors face a problem common for all types of polymers, namely, the separation of materials suitable for further processing from general municipal solid waste, and interspecific separation. Enterprises that recycle polymers, already use these technologies of interspecific and interbrand separation, but they are economically unprofitable, which makes it necessary to create additional economic conditions for processing (Frolova, 2019). From a competitive advantage perspective, polymer processors need to find the unique set of value-added chain processes that will provide the enterprise with a long-term competitive advantage. Table 2 shows the main and supporting processes that affect the competitive advantage of enterprises in the field of polymer recycling.

**Table 2.** Main and supporting processes of forming the value-added chain of enterprises in the field of polymer recycling

Process name	Description of the mechanism for forming a competitive advantage
Main processes	
1. Receipt and storage of materials, equipment (incoming logistics)	Correctly organized storage of raw materials, equipment of small and medium-sized enterprises in the field of recycling contributes to an increase in the rhythm, continuity of the production process, as well as maintaining the quality of raw materials and materials used. Inbound logistics is an important process of creating a competitive advantage for small and medium-sized enterprises in the field of polymer recycling, contributing to meeting lead times through timely loading of production capacities.
2. Operating activities	The organization and implementation of operating activities determines the balance of the company's internal reserves, the complication or simplification of business processes, the amount of capital-intensive investments, the formation of costs associated with operations to create finished products (sorting, washing, pressing, packaging and other operations to create the final product). This, in turn, determines the position of the enterprise in the competitive struggle.
3. Distribution chain (outbound logistics)	Outbound logistics forms competitive advantages of the enterprise by organizing the timely shipment of finished products to the consumer, delivery at the time required for the end consumer.
4. Marketing & Sales	Search and organization of sales channels for finished products and marketing activities determine the effectiveness of small and medium-sized enterprises in the sale of products to consumers. The competitiveness of enterprises in the field of recycling is directly correlated with the results of sales of finished products.
5. Customer service	Organization of the service, namely, customer and information support, forms the image of the company as a reliable business partner, increasing its value in eyes of the consumer. The strength of the company's position in the market, and hence its competitiveness, depends on the effective work with clients.
Supporting processes	
1. Creation of enterprise infrastructure	The type, quality of existing infrastructure and costs of its maintenance affect the competitive potential of small and medium-sized enterprises in the recycling sector. The infrastructure of small and medium-sized enterprises is general management, product quality management, planning, communication and accounting. The listed infrastructure elements determine the company's strategy, it is impossible to ensure a

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	competitive advantage of small and medium-sized enterprises in the field of recycling without it.
2. Supply activities	A clear delivery of secondary raw materials, necessary to produce finished products, create and maintain stocks, significantly affects the duration of production cycles of small and medium-sized enterprises. The entire procurement strategy of the company may depend on the organization and functioning of supply activities, which in turn affects the costs of maintaining stocks, the costs of purchasing raw materials and other materials, forming a competitive advantage of the enterprise by reducing the costs of purchasing and maintaining stocks.
3. Research activity, technological development	Continuous updating and innovative development of production processes, technological solutions for sorting mixed polymers allow the company to maintain significant interest from consumers. Applying modern technologies, the processing enterprise expands the field of application of finished products from secondary raw materials, improves the quality of products from secondary polymers, bringing them closer in properties to the original raw materials. Thus, the strategy of innovative and technological development of small and medium-sized enterprises in the field of recycling, carried out on a scientific basis, is the basis for creating and maintaining a competitive advantage through maximum satisfaction of consumers of finished products.
4. Personnel management	Human resources management is a prerequisite for a competitive advantage. Personnel policy is related to recruitment, training, compensation of the personnel of the enterprise in the field of recycling. The competitiveness of small and medium-sized enterprises directly depends on the degree of qualification of the personnel involved in satisfying the consumer's need for a quality finished product.

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Source: authors.

There are no significant differences in main processes of the value-added chain of enterprises in the field of polymer recycling in linear and circular economies. When considering supporting processes of forming the value-added chain of small and medium-sized enterprises in linear and circular economies, it is worth noting that in terms of increasing the competitiveness of products of the enterprise processing polymer materials, a linear economy introduces significant restrictions on the creation of competitive advantages of the enterprise's products and its market position. In a linear economy, the process of supplying small and medium-sized enterprises is associated with the purchase and extraction of raw materials from landfills, which is associated with the priority of waste accumulation at disposal sites. Only a small proportion of polymers come from recycling companies. Often the quality of raw materials from these suppliers is very low, which is due to the lack of separate sorting of waste, a high degree of contamination and branded mixing of various groups of polymers. In a circular economy, the priority of waste accumulation is shifting from landfills in favor of waste sorting stations and enterprises for the collection of secondary raw materials, where raw materials are supplied in "pure" form and those grades (mainly polystyrene, polyethylene terephthalate) that are most preferable for subsequent processing. This is achieved by observing the canons of a circular economy, which considers all waste from the perspective of a valuable resource. The impact of research activities on the performance of small and medium-sized recycling enterprises also differs depending on the economic model used. In a linear economy, research developments are economically unjustified, which is associated with their high cost and economic inexpediency. In a circular economy, the situation is reversed - research and development in the field of recycling polymer waste is the primary task of both manufacturers and the state, which reduces the cost of these developments for recyclers.

Analyzing the main and supporting processes of the value-added chain as the basis for the competitiveness of enterprises processing secondary polymers, we can conclude that the consideration of these processes should be inseparably connected with commodity circulation from the formation of polymer waste to their transformation into finished products. To solve this problem, it becomes necessary to reorganize commodity circulation and “reappraise” the place, role and significance of participants in commodity circulation. A comparative characteristic of commodity circulation of secondary polymers in a linear and circular economic model is presented in Table 3.

**Table 3.** Comparative characteristics of commodity circulation of secondary polymers in a linear and circular economic model

Comparison criterion	Characteristics	
	Linear model	Circular model
Participants in the distribution process	Enterprises collecting and procuring raw materials; polymer processing plants; solid waste landfills, waste sorting complexes and waste transfer stations.	Enterprises collecting and procuring raw materials; polymer processing plants; solid waste landfills, waste sorting complexes and waste transfer stations; industrial enterprises, trade enterprises and other enterprises, from the activities of which polymer waste is generated; enterprises collecting and procuring raw materials, the population.
Concentration of most of secondary polymers	Most of recycled polymers are concentrated in places of accumulation - landfills, authorized and unauthorized dumps.	Most of recycled polymers are concentrated in waste sorting, waste transfer stations and recycling sites.
Role and importance of processors in commodity circulation	<i>Secondary.</i> Plants processing secondary polymeric materials process no more than 15-20% of all produced polymers.	<i>Main.</i> All the resulting polymeric wastes are recycled.
Quality of raw materials involved in commodity circulation	<i>Low.</i> This is due to the high degree of contamination of polymer waste.	<i>High.</i> This is due to the absence of contamination from the separate collection of waste.
Origin of the product distribution process	Commodity distribution originates from landfills, where procurement enterprises extract raw materials suitable for further processing.	Commodity distribution originates from the population, where polymers undergo the first filtration with separate waste collection.
Collection as a stage in the distribution process	Collection of polymeric waste starts from specialized organizations - procurement and production and procurement enterprises, dispersed across many collection points (landfills, dumps).	Collection of polymer waste starts from the population and housing and communal services. Only a small part of polymers ends up in accumulation and disposal sites (landfills, dumps).
Stocking as a stage in the distribution process	Stocking involves the separation of valuable secondary polymers from the general waste stream, which are suitable and economically interesting for processing.	Stocking assumes inter-separation from already selected polymers.
Processing as a stage in the distribution process	In processing polymeric waste, recycling enterprises receive polyethylene terephthalate flakes and granules, as a rule, used to produce other products.	In processing polymer waste, recycling enterprises receive products suitable for use for their original purpose.

Source: authors.

A comparative analysis of commodity circulation of secondary polymer materials in linear and circular economies showed that the difference for medium and small-sized enterprises in organizing commodity circulation in these economic models is colossal. Without the transition to a new closed economic model, it is impossible to increase the competitiveness of enterprises processing secondary polymers and their products, which means that it will not be possible to solve the problem of recycling polymer waste either. The transition to a circular economy, in addition to solving urgent environmental and social problems, solves the main economic problems of polymer processing enterprises - how to make polymer processing economically viable and enterprises competitive.

The basis of a circular economy is the rational use of natural resources to save resources and reduce environmental and social threats. The widespread use of polymers in production and everyday life creates serious environmental consequences, which is since the life cycle of used plastic ends in landfills. This problem is successfully solved by small and medium-sized enterprises processing secondary polymers using innovative recycling technologies. These technologies are based on principles of a cyclical economy, which makes recycling economically attractive and creates conditions for increasing the competitiveness of small and medium-sized enterprises that have been recycling polymer waste for many years.

It should be noted that the competitiveness of products of enterprises processing secondary polymers is largely determined by such parameters as: it is economically feasible to use only those materials for which there is a real opportunity to close the technological chain and create waste-free economic cycles and reduce the level of energy and water consumption in processing secondary polymers in terms of the production of primary material.

The study of the value-added chain in processing recycled polymeric materials allows us to conclude that only a complete reorganization of their distribution, as well as the effective organization of the main and supporting processes in a circular economy will allow small and medium-sized enterprises to achieve long-term competitive advantages in the field of recycling in the secondary polymer market. First, the reorganization should affect the place and role of participants in the distribution of goods, the main stages of this process and supporting processes of forming the value-added chain of enterprises in the field of recycled polymers processing.

## **7. Conclusion**

The main difference between a circular economy and a linear economy is that a linear economy focuses only on economic growth without predicting further consequences from the results of economic activity. A circular economy refers to a philosophical concept that affects not only the economic side, but also other aspects of human life, namely the social and environmental consequences of economic activity. One of the key areas of a closed-cycle economy is the creation of resource loops, which is possible when recycled polymer processing plants use only those materials whose characteristics, properties and features will close the resource chain. The analysis of the main conceptual provisions of a circular economy from the point of view of increasing the competitiveness of enterprises in the field of recycling of polymers and their products showed that the use of polymers is expedient and does not contradict the canons of a circular economy.

The main and supporting stages forming the value-added chain of products of recycling enterprises form the competitive potential of the enterprise and its products. One of the limiting factors for the development of the competitive potential of enterprises in the field of polymer recycling is the ineffective organization of commodity distribution of secondary polymer materials, which is characteristic of a linear economy. In turn, the ineffective organization of commodity circulation of secondary polymers has a destructive effect on the value-added chain for products of recycling enterprises. Thus, one of the main methods increasing the competitiveness of enterprises in the field of recycled polymers processing is the reorganization of commodity distribution of recyclable materials and correction the value-added chain. It includes some natural stages:

1. Involvement of the population and enterprises, which generate waste in the process of commodity circulation of secondary polymer materials as full participants;
2. Organization of separate waste collection to isolate secondary polymers at the places of their generation;
3. Shift of the position and role of recycled polymer processors as secondary participants in the distribution process towards the key participants in this process.
4. Change in priority from the traditional disposal of secondary polymer materials at landfills in favor of their processing with subsequent use for their original purpose.

The implementation of these stages will make it possible to adjust the product distribution process and processes of generating the value-added of products for processing secondary polymers, which, in turn, will affect the competitiveness of these enterprises and their products in the market.

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