

PLASTICS
Material which should be reused not dumped

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ABSTRACT

Plastics is irreplaceable material of the 21st century. It can be used in every human activity. Due to its negative features - 4% of raw oil is used to produce plastics although oil is considered a limited natural resource; it semi-disintegrates in 500 years; presence of chlorine in it, plastics has a great impact on environment pollution.

As the life standard increases, the percentage of plastic waste in communal dumps increases in the countries of transition. In Yugoslavia, plastics factories generally buy ready-made plastic granules and use them in the production of their plastic products. Some of the factories recycle only plastics which remains as a waste material in their production.

Only private factories recycle used plastics (PVC, polythene, polypropylene and polystyrene). First, used plastics is sorted, then washed, dehumidified and finally ground. Plastic granules, which are produced in this way, are ready for melting. About 80% of plastics is used in this process.

Approximately, 12% of total communal waste in Novi Sad is plastic waste. Due to the lack of precise programmes for the integral management of waste on local level, old technology and chronic lack of financial means, the possibilities for plastics usage are few. It should be used more since it has a great production potential as well as a potential in the production of liquid fuel (petrol, diesel without S, Pb).

Novi Sad with its 300 000 citizens presents free market with a great possibility to implement investment and development projects which is a condition for profitability of this industry branch.

Keywords: plastic recycling, investments, profit

INTRODUCTION

As the standard of life increases in countries in transition, so the amount of plastic refuse also grows significantly. Plastic contains high levels of chlorine and is not biodegradable, and therefore has a significant negative impact on the environment as refuse. Therefore, processes for effectively recycling plastic refuse would make a significant contribution to reducing environmental damage.

The use of recycled plastic as a raw material reduces the amount of energy required for *production*. For example, the production of one ton of ethylene from raw materials uses 114,7GJ, while producing the same amount from recycled materials requires only 14.05

GJ of energy. This rationalization of energy use clearly indicates the potential for substantial savings.

Recycling plastic materials is significantly complicated by the fact that every material has to be sorted by hand. The separation and moulding facility located in Novi Sad is one of the most prestigious in the Balkan states, and the only facility of its kind in Serbia and Montenegro.

It is suitable for further investment, which involves obtaining highly developed and sophisticated technology for recycling. This is expected to happen within the next five years. The town council has already financed half of the investment in the first phase but now, in the second phase, it is required to buy machines that are already used by most of the big companies of the Western world such as *Erema* in Austria.

METHODS

1) SEPARATION

In order to maximize recycling of the communal waste of the town of Novi Sad, *JKP Cistoca* administers the selection of suitable materials in two stages:

1. primary selection (separation at its source – at home)
2. secondary selection (separation at depots)

The basic operation in the recycling process is the separation of materials into different product types.

The first analysis of collected plastic refuse is done visually by separation of recognized shapes:

- a) PET bottles (fizzy and non fizzy drinks and cooking oils).
- b) Other bottles and containers – (packaging for various products)
- c) Cups for dairy products such as yogurt and buttermilk
- d) Containers for packaging of margarine and similar spreads
- e) Various plastic bags and cling film
- f) Tetrapak packaging
- g) Other plastic household litter

After separation visual recognition is made - swift identification. The next step is the individual identification of the most common types of plastic materials.

Visual recognition of types of plastic materials is made on the basis of their function, design and product packaging. Previous experience and knowledge of the design of particular types of plastic materials is used to recognize of certain types of plastic materials.

In spite of legislation to encourage the use of recycled materials in production, the volume of house separation, separate collection, reusing and recycling of waste on the national market is still unsatisfactory due to various reasons:

- the lack of precisely defined programs for management of waste on the local level
- old technology
- public services encounter various problems, such as obsolete equipment, use of inadequate technology, lack of profitability, insufficient finances for running costs, and lack of funds for investment into the development projects.

2) RECYCLING OF PLASTIC

It is estimated that 100 million tons of plastics is used in the world per year. In Novi Sad, plastics contribute 11.5% of the entire communal waste, which is 32.1 tons daily, and 11,714 tons annually. It is very difficult to decide on the appropriate recycling technologies for this type of communal waste. An additional problem is that plastics separated from other waste can easily become unusable once damage or pollution from different types of plastic occurs. Secondary separation consists of specially designed containers for collection of different types of plastics. The price of containers would vary from \$1000- \$1500 per ton of plastic waste, which would be totally unprofitable.

Many drawbacks in the recycling of plastics have today been almost completely removed, and recycling of plastic is very profitable. Many manufacturers are now producing equipment which can produce recycled plastic raw material the characteristics of which are independent of the quality and type of plastics used for recycling. Plants using this equipment are capable of working on any type of thermoplastics from both industrial and communal waste. They can work with materials that comes molded, in blocks, tubes or in any other shape or form. Systems are completely automatic. The capacity of these facilities is from 200 – 2000 kg/h. The facility in Novi Sad is designed to produce 1500kg/h. This would be perfectly suitable if the factory focused only on plastics.

All JKP Cistoca's projects and programs are focused on meeting world standards in dealing with waste. The most important completed project was the completion of one such factory, the first not only in Serbia and Montenegro, but in the whole of South East Europe. The project for this factory was completed in the winter of 2001, and the entire factory was finished in less than a year. The entire value of this investment was 2 million dollars. With the completion of this factory, Novi Sad has added its name on the list of other modern cities that deal with the treatment of waste according to the standards of developed countries. At the same time, ecological standards are respected and the lucrative business of manipulation of waste has been started. This way of treating the waste is one of the conditions for joining the European Union, and Novi Sad has shown once more that is capable to be a leader in the development of the whole country.

WORKING WITH PLASTICS

It is common practice in our country that companies buy ready flakes or pellets for the manufacturing of various products. The type of plastics they use is clean plastics that remains after their production. Factories do not recycle old plastics for the lack of appropriate technology.

Recycling of plastics is conducted by small, private businesses. They recycle PVC, polyethylene, polypropylene and polystyrene. They sort it out first and then wash, dry and grind. That way, flakes and pellets to go for melting are obtained, and 80% of plastic can be used.

After the completion of the first phase of the building of the factory for separation and moulding of waste, JKP Cistoca is planning to invest in *Vacurema* machines made by the Austrian company *Erema*, the leading manufacturer of machines for recycling PET packaging.

PET Recycling with patented VACUREMA® Technology

Erema has developed a special patented recycling technology (VACUREMA®) for PET Recycling. Thanks to its high technical reliability and cost-efficiency, plus the high quality of the finished pellets, numerous *Erema* PET recycling systems throughout the world are already taking care of our PET "offspring". In November 2000 the products (pellets) made by the VACUREMA system were certified food-contact compatible by the US-FDA (Food and Drug Association) and by the European Fraunhofer Institute. Since then many national institutes have also confirmed the food contact compatibility of PET produced using the VACUREMA extrusion process.

RESULTS

The morphological content of communal waste is estimated by sampling from different location over a period of 7 days during the summer, when the quantity of biodegradable litter is much higher. The total daily weight of the waste is 270 tons, of which plastics contribute 11.58%. However, plastic waste occupies 35% of the entire volume of the refuse, which means that plastic is the second most common material after biodegradable substances which occupy 36% of the volume.

After thorough research into the contents of communal waste and investment in the processes of separation, moulding and recycling, as well as projecting the approximate annual amount of plastics in communal waste from the city of Novi Sad and surrounding area in the period from 2006 – 2021 , the following results were obtained:

Table 1: Projected profits from the investment program of JKP Cistoca over the period from 2006 – 2021

	2001	2006	2011	2016	2021
Plastic	21,120	23,800	26,200	28,100	30,000
PET packaging	4,435	4,998	5,520	5,901	6,300
Profit (per year) * EUR/t	310,450	349,860	386,400	413,070	441,000

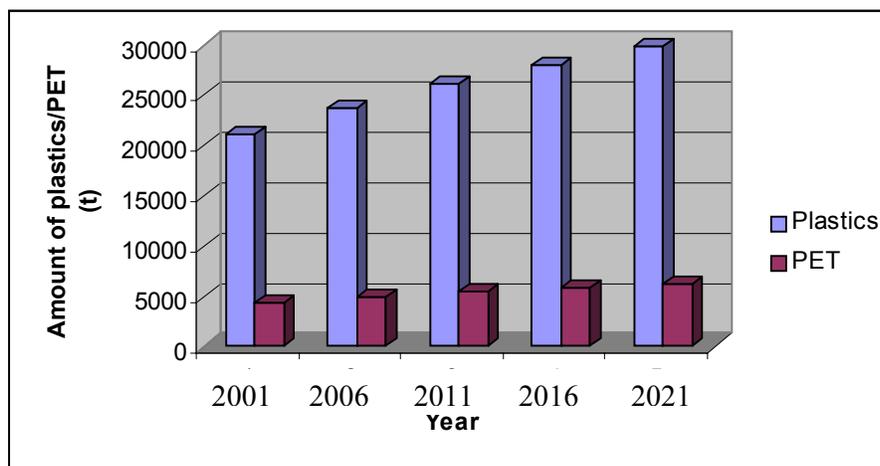


Fig 1. Annual amount of plastics in communal waste from the city of Novi Sad and surrounding area in the period from 2006 – 2021 compared to amount of PET

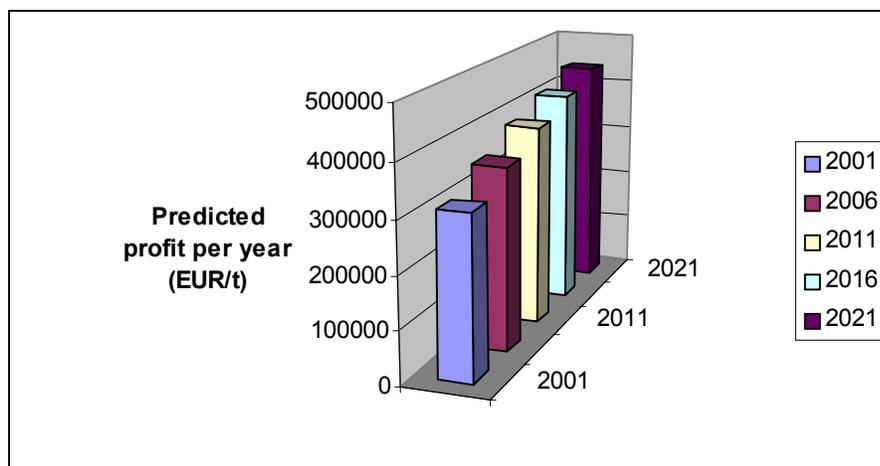


Fig 2. Projected profits of recycling PET packaging for the period from 2006 – 2021

CONCLUSION

Novi Sad with its 300,000 citizens offers a free market with great potential for the investment and development required to make this industry a profitable one.

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