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CONFERENCE PAPER

Recycling posibilities of packaging wastes-the case of Kırıkkale

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ABSTRACT

Packaging wastes arise as a result of the use of packaging materials, which are natural resources. Packaging wastes have an important share in solid wastes. For this reason, it is necessary to address the issue with a sustainable waste management plan, to promote recycling activities and to prevent pollution. Another important issue is the data logging system of packaging wastes. The fact that collection activities originating from scavengers can not be recorded, therefore, a proper waste management plan can not be created and it is not known exactly where the raw materials are recycled. Collection and recycling of packaging waste is important and necessary in order to ensure the continuity of sustainable development.

In this study, the process of collecting, sorting and recycling packaging wastes on 31 stations in Kırıkkale province was examined. Stations include markets and shopping areas. The study was conducted by taking daily data for January, February, March and April 2017. The collection process was carried out for every 2-3 days with 2 workers who were working in packing waste collecting-sorting and plastic breaking production facility. The collected packaging wastes are separated according to their composition. Wastes collected by vehicles were brought into service and weighed.

Paper packaging and PE plastic types wastes are sent to facilities that have a recycling license by pressing. PP plastic packages were turned into burrs and sent to licensed recycling plants. Packing waste outside of paper cardboard and plastic types is not collected because it is not a receiver unit in the vicinity.

In the study, recycling of packaging wastes management with environmental and economical aspects, management components, importation, exports and so on are evaluated. As a result of the study, the management of packaging waste in Kırıkkale was examined and the composition and quantity distributions of the collected wastes were evaluated. In addition, the effects of application of the recycling of packaging waste in Kırıkkale have been evaluated with obtained results.

Keywords: Recovery, recycle, waste management, packaging wastes

1. INTRODUCTION

In parallel with an increase in population in the world and Turkey, the amount of solid waste is increasing day by day and the recovery of solid waste is becoming significantly important. Due to the recovery of packaging waste, natural resources are conserved, energy is saved, the amount of waste is reduced, the requirement for storage area is reduced, the load intensity of the collection system decreases and foreign dependency is reduced if the raw materials required for production are imported [1]. Everyday increasing in the life standarts with increasing daily population causes changes in both waste volume and waste composition. An integrated waste management is a prerequisite for the reduction and disposal of this amount of waste. Today, the first two important steps in integrated waste management hierarchy are: waste prevention and waste reduction. The others are respectively; re-use, recycling, recovery and finally as final disposal [3].

The most important share among solid wastes is packaging wastes. Packaging wastes are recyclable because they are manufactured from materials, such as glass, plastic, metal, paper and composite. Recycled

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packaging wastes are often used as secondary raw materials by incorporating them in the production. In order to recycle packaging wastes, it is necessary to collect them separately from garbage in the same way as in developed countries and deliver them to the recycling industry in a clean way.

The largest proportion of recoverable waste is paper and cardboard with 45.5%, glass with 18.5%, and packaging waste with petroleum origin with 22.7% [4].

2006 in Turkey on Packaging and Packaging waste recovery rate in the total solid waste according to the statistical result is given as 33% [5].

Thus, it is necessary to collect packaging wastes by the waste producer in a separate bag or box in a clean and healthy way. The works including the collection of wastes separately from the landfill in a clean and organized way, the transport to the separating plant and the delivery to the relevant recycling industry after separation according to types are called "*separate collection at source application*". Packaging wastes can be collected in a separate, clean, efficient, healthy and hygienic way with separate collection at source applications [2]. Separate collection at source is the most accurate way of collecting packaging wastes, but there are few applications of this in Turkey. As in this study, packaging wastes are collected in a mixed way and then separated according to their composition in the related plants. In study, the management this and importance of packaging waste were examined with a pilot study.

2. MATERIALS AND METHOD

The study was carried out in a facility located in Kırıkkale, which has a total area of 5252 m^2 and operates in packaging waste collection, separation and non-hazardous waste recycling activities. The process started with the collection of packaging wastes from thirty one stations. The red dots on the map indicate A-group supermarket chain while blue dots indicate B-group supermarket chain (Fig 1).

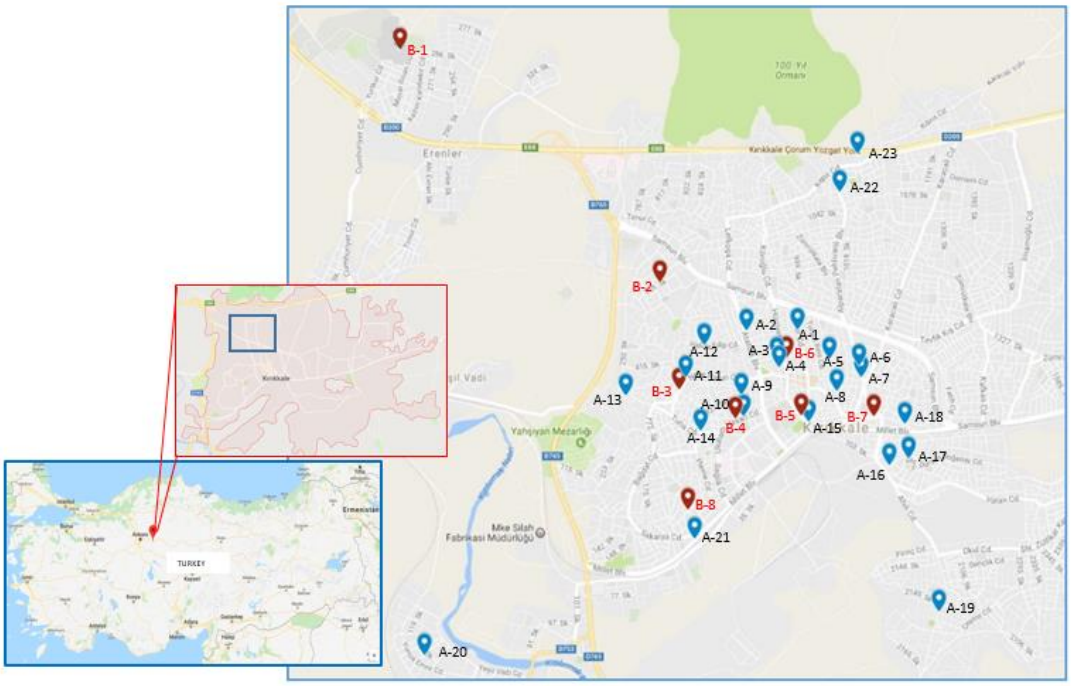

Fig 1. The location of Kırıkkale in Turkey and study area and sampling stations

The collection was carried out in January, February, March and April of 2017. The collection of wastes was done by two workers.

Data were obtained from a total of 32 stations. These stations are markets where packaging waste is concentrated. The collection was carried out every 2 to 3 days within the specified 4 months. The packaging collection tools (PP, PE and paper-cardboard) were collected from the stations together with the package collection tool and 2 personnel. Then, the collected packaging wastes were stored in the mixed storage area and the wastes in the separation unit were separated according to their types. During this process both types of wastes were determined and their quantities were determined.

After this process, the pressing packages were pressed and shipped for re-use.

The packaging wastes were brought to the separation plant and separated into four basic groups: paper, glass, metal and plastic. The wastes brought to the plant as mixed were taken to the separation band and then the staff responsible for separating each material group completed the separation process on two sides of the band. The separation staff separated packaging wastes passing over the band according to their type. The separated packaging wastes, which were accumulated in the sections on the band, were taken to the pressing unit and the pressed wastes were stacked according to their types and stored for the delivery to the relevant recycling facilities.

The whole process in the plant is as follows: the collection of packaging wastes from the market, the storage of them in the mixed storage area, the separation of wastes according to their types in the separation unit, the pressing of packaging wastes and the delivery of pressed packaging wastes.

The packaging waste collection and sorting activity unit of the plant includes mixed warehouse area, metal warehouse area, paper-cardboard warehouse area, plastic warehouse area, pressing areas. The packaging waste collected from the market in this unit is separated and transported to the vehicles by pressing. In the press machine, the packaging waste that has been separated into the facilities is pressed and made ready for shipment. 100 tons of paper-cardboard packaging and 50 tons of metal packaging are pressed daily in the press machine.

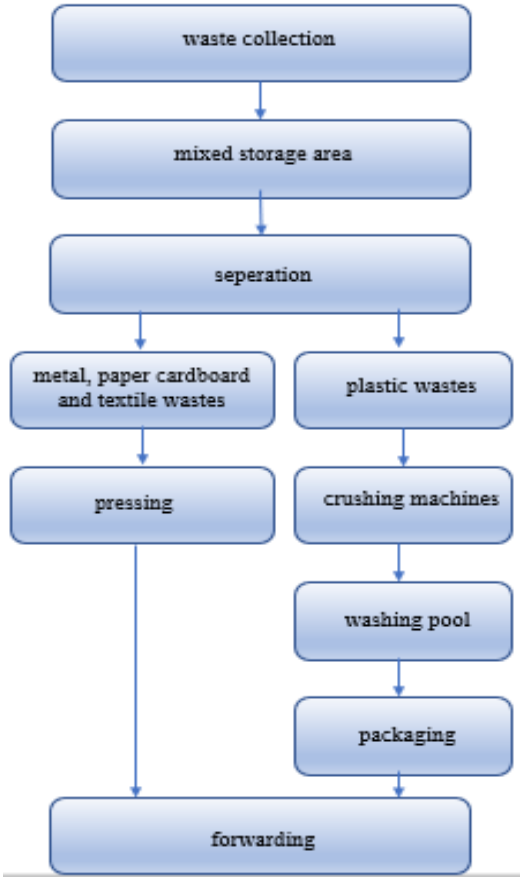

Fig 2. Packaging waste collection - separation activity management scheme

3. RESULTS AND DISCUSSION

The packaging wastes were stored in the cages in the storage area of the shop. It was determined that the cages had a waste collection capacity between 20 and 40 kg. According to the workload of the shops located in stations, it was determined that the shops used one to four cages per day. It was found out that the wastes coming from the stores consist of three groups: PP, PE and paper cardboard. Fig 3 shows the compressed waste papers and plastic wastes in the plant.

The waste types and quantities of the stations in January, February, March and April of 2017 are given in Table 1. As seen in Table 1, two of A stations group and only one of B stations group are not active stations In general, waste compositions and their quantities are increasing or decreasing according to their capacities.

Fig 3. Waste paper in the form of compressed and sent to the recycling of plastic waste before processing

Paper packaging and PE plastics were pressed and delivered to the facilities having a recycling license while PP plastic packages were turned into burrs and sent to license recycling facilities. Fig 4 and Fig 5 shows the overall composition distribution for January, February, March and April of 2017.

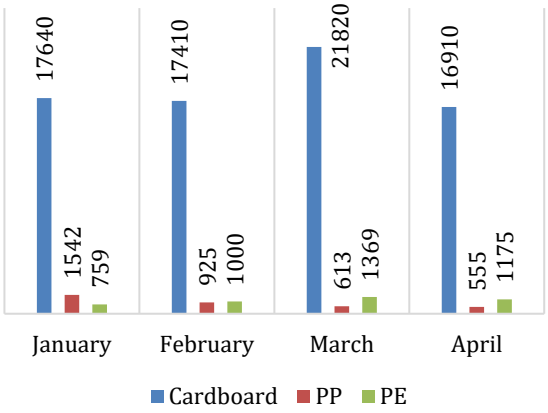

Fig 4. Packaging wastes amounts of January, February, March and April 2017

Table 1. Amount and composition of the stations for January, February, March and April 2017

Stations	January	February	March	April
A-1	870	785	820	885
A-2	545	578	610	570
A-3	705	710	703	700
A-4	920	899	902	900
A-5	515	450	425	415
A-6	355	368	295	370
A-7	360	350	366	375
A-8	470	485	550	560
A-9	240	195	230	185
A-10	515	493	412	415
A-11	365	352	380	365
A-12	1065	950	882	600
A-13	445	550	772	940
A-14	temporarily non-active station			
A-15	350	287	292	260
A-16	160	155	164	130
A-17	615	555	512	490
A-18	130	155	169	185
A-19	540	552	541	580
A-20	temporarily non-active station			
A-21	395	412	420	430
A-22	730	698	725	690
A-23	160	156	125	130
B-1	945	987	953	915
B-2	785	775	730	720
B-3	temporarily non-nactive station			
B-4	150	175	180	200
B-5	160	183	195	200
B-6	185	170	150	130
B-7	270	263	255	285
B-8	155	190	185	230
Total	13,100	12,878	12,943	12,855

Paper, cardboard and other types of packaging waste other than plastic types are not collected because they are not the receiving units in the vicinity. In the plant process, appropriate process change for waste reduction is being investigated. For the moment, there is no change to waste reduction in proce- dures. Wastes that are accepted for processing plastic materials (except packaging), plastic and rubber, paper and cardboard packaging, plastic packaging, wooden packaging, metallic packaging, composite packaging and glass packaging waste recycling and also used again in the administrative office waste and the waste printing tiles containing dangerous substances are replenished and refilled. Edible liquids and fats resulting from the food prepared for the crew are deposited in the licensed company's waste collection bin and given to the licensed company. Mixed municipal wastes of the facility are taken with the municipal waste collection vehicles of Kırıkkale Municipality and forwarded to the regular landfill site. Alkaline batteries originating from the administrative office were collected from 2017 and collected by the Portable Battery Manufacturers (Tap) Association. In addition, hazardous wastes generated during operation are subjected to recycling.

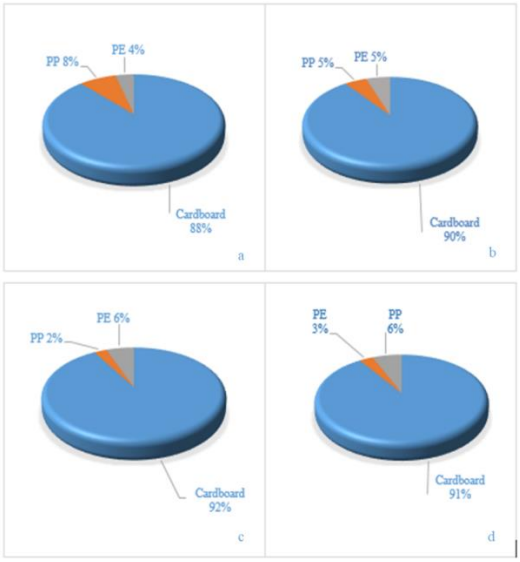

Fig 5. Packaging wastes distribution of (a) January, (b) February, (c) March and (d) April 2017

4. CONCLUSION

Collection waste at source is a time consuming, costly work that requires manpower. A healthy and productive recovery work is possible with a system that will be realized by a coordinated work of all parties. In order to efficiently operate the packaging waste management system and satisfy the public, it is necessary to operate the collection system effectively as planned.

In Turkey, the amount of solid waste and its composition has changed in parallel with population growth, changing living standards and the developments in technology and the recovery of

packaging waste, which has high volume in solid wastes, has gained great importance.

In order for the packaging waste management system to be operated efficiently, it is necessary to operate the collection system effectively as sustainable planned. For this reason, the collection system is very important part of the management and should be easily accustomed and applicable in accordance with the social, economic and environmental perspective of the society.

At the end of the study, only paper cardboard and plastic types were obtained. The delivery of collected packaging wastes to the relevant recycling facilities is the last step in the process. Because there are no facilities around Kırıkkale for delivering packaging wastes other than plastic and paper cardboard wastes, packaging waste types except these wastes cannot be collected. In this regard, appropriate process changes for waste reduction in the plant process have been investigated.

A fact that emerged in the process of study, in order to collect the packaging wastes separately at the source, it has been obliged to collect the packaging wastes from the houses and the packaging waste enterprises by acting together with the municipalities, licensed companies and authorized organizations. The collection process is the most costly part of the management system as our study. And also as the collection of waste at the source is time consuming and laborious. The municipalities have very serious duties.

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