

## WASTE PACKAGING MANAGEMENT IN REPUBLIC OF CROATIA

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### ABSTRACT

*By reason of the deposit model of the Ordinance on Packaging and Packaging Waste nearly the total beverage packaging waste is collected and recovered. Collectors, transporters and recyclers are designated by the Environmental Protection and Energy Efficiency Fund. Its duty is to pay for collection and transport, so the Fund is the owner of all gathered waste. The paper explains the waste packaging management system in Republic of Croatia.*

**Keywords:** waste packaging management, PET bottles, aluminium and tin cans, glass bottles

### 1. INTRODUCTION

The Croatian government passed a *Strategic Development Framework 2006 – 2013*. This is the all-inclusive document for national environment policy. Below the *National Environmental Strategy* and the *National Environmental Action Plan* are provided. The first subdivides into sub-sectors – one of them deals with *National Waste Management Strategy*. The Packaging ordinance of 2005, being implemented since 2006 produced relief for a certain part of waste – waste packaging. [1]

### 2. ORDINANCE ON PACKAGING AND PACKAGING WASTE

In the time from the commencement of the Packaging Ordinance at the beginning of the year 2006 until the end of April 2010 approx. 83,500 t of PET-beverage bottles, 230,500 t of glass bottles and 5,400 t of aluminium and tin cans have been collected. This represents more than 90% of the bulk sum of the market. [2]

The producer, what means the company who packs or imports packed products, has to cover the expenses of collection, disposal and recovery of waste packaging products he has placed on the market. Therefore all producers must submit an annual report on the types and amounts of packaging placed on the Croatian market in the previous year to the *Environmental Protection and Energy Efficiency Fund* by 1<sup>st</sup> of March of the current year. [1]

The seller of packed goods with sales premises larger than 200 m<sup>2</sup> has to allow the setting up and manoeuvring of containers for the collection of packaging waste, the temporary storage thereof and must organize the transport of collected packaging waste from the sales premises and temporary storages to the waste management- or recovery-companies. Packaging waste, accumulated at the sales premises, must be sorted free of charge according to the basic classification: glass, paper and cardboard, composites, metal, aluminium, PET, other plastics, wood and textiles. The seller is also responsible for the payback of a returnable fee of 0,50 HRK per each unit of non refillable beverage packaging, brought back by customers. Refunded amounts are paid back by the Fund. [1]

Fee- and Deposit-System includes several fees for disposal and return of one-way packaging as well as some kind of "incentive fee" (Figure 1). [1]

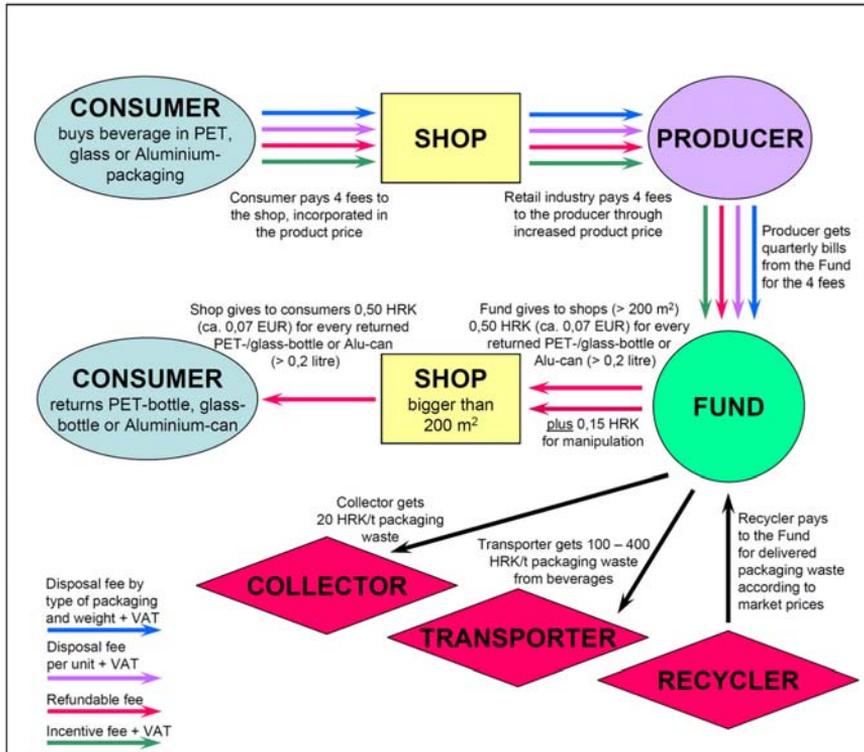


Figure 1. Fee- and Deposit-System in Republic of Croatia [1]

### 3. WASTE MATERIAL FLOWS IN THE SYSTEM OF WASTE PACKAGING COLLECTION IN CROATIA

The waste packaging returned to the selling points by the consumer after being sorted according to the type of material is delivered to the authorised recyclers. The flows of PET, Al/Fe and glass packaging in Croatia are explained further in the text.

#### 3.1. PET packaging flow

Today plastics rank among the most important materials and are simply indispensable in our everyday life. Worldwide about 250 million tonnes are produced each year. Plastics are produced from crude oil and prices for this raw material have been rising continuously for years. Up to the 1970s, you had to pay less than US\$5 for one barrel. [3] The record peak of US\$145 for one barrel was reached in July 2008. Today it is close to the \$75 mark. [4] This fact plus the growing mountains of waste are two reasons why the subject of recovery is becoming ever more important. [3]

PET packaging marks a very high percentage of return, and is delivered through the waste packaging management centres to the authorised PET packaging recyclers (Fig. 2). With the *bottle-to-bottle* recycling procedure the PET packaging closes the cycle by returning into the same product – bottle, but more often the PET packaging is recycled into the products for non-packaging applications.

Pure, recycled PET does not differ from the original PET, and can be recycled into many different products. It can be used for the production of bottles for non-nutritional applications such as household cleaning agents and chemicals. In the countries where the legislation allows it, the application of PET recyclates for the production of beverage bottles is greatly increasing. However, the most important secondary application of PET recyclates are the polyester fibres for the production of clothes or as filling agents in jackets or bedclothes, and for the production of carpets.

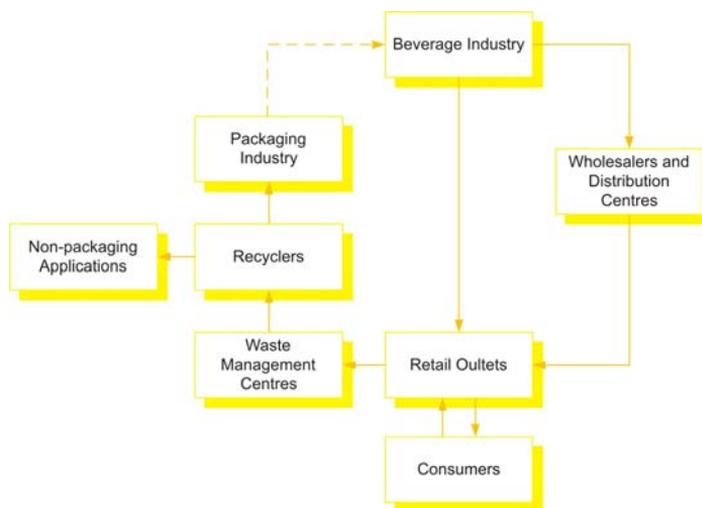


Figure 2. PET beverage container lifecycle

### 3.2. Al/Fe and glass packaging flow

The cans mark a very high percentage of return rates and through the Centres for waste packaging management they are delivered to the authorised recyclers of Al/Fe packaging. Aluminium and steel cans are sorted and stored, so that the Al/Fe packaging flow has not yet been closed.

Glass packaging has marked a very high percentage of return as well. It is delivered via centres for waste packaging management or directly from the collectors to the authorised glass packaging recyclers. By the recycling procedure, glass packaging fully closes the cycle by returning into the same product – bottle.

## 4. CURRENT SYSTEM OF WASTE PACKAGING COLLECTION SYSTEM IN RH

All the retailers are obliged to deliver the entire taken-back PET, Al/Fe and glass waste packaging to the authorized collector exclusively in special bags of the Fund with a safety string and adequate label containing the identification code. The collected bottles are dispatched by the authorized collectors to the waste management centres, where they are sorted (PET, Al/Fe) and baled or crushed (glass) and delivered to the recycling centres.

### 4.1. Phase 1 – receiving of waste packaging from the consumers and bagging (retailers)

The retailer may choose to handle the returned containers in a manual fashion. Alternatively, retail outlets with a sufficiently high volume of container returns may select to automate the process using reverse vending machine (RVM) technology. However, the basic advantage of the reverse vending machine – compression and grinding of the packaging material in order to reduce the volume, and thus also the transport costs, has not been utilised since the packaging is packed into bags without being compressed.

The bags are closed by special strings supplied to the retailer by the Fund together with the bags. On the packed bags the retailers have to place a safety sticker which they receive from the Fund with the identification number (2D barcode) of the bag. The safety stickers are delivered to the retailers in the quantity which equals the delivered number of bags.

The number of waste packaging items that are placed in the bag has to match the number of items of the waste packaging that is printed on the bag. PET waste packaging is collected in yellow bags (50 items in a bag), Al/Fe waste packaging in grey bags (100 items in a bag), and glass waste packaging in green bags (40 items in a bag). The retailers, who have installed RVMs, pack the waste packaging in special-purpose bags of the Fund of higher capacity (PET – 200 and 400 items, Al/Fe – 800 and 1000 items).

#### **4.2. Phase 2 – receiving waste packaging from the retailers (collectors) and delivery to waste packaging management centres or recycling centres (glass packaging)**

When receiving waste packaging from the retailer, the collector weighs the bagged waste packaging and delivers the received bags of PET and Al/Fe waste packaging to the nearest authorised centre for waste packaging management. In the Republic of Croatia there are 24 authorised waste packaging management centres. Glass packaging is not delivered to the Centres, but rather transported to temporary warehouses of the authorised collectors, i.e. directly to the recycler.

#### **4.3. Phase 3 – receipt of waste packaging at waste management centres or at recycler's (glass packaging)**

The total quantity of the waste packaging supplied by the collector is weighed at the Centres. Before opening the bags the identification number is decoded and entered into the database, then each bag is opened, the contents counted (except for glass packaging), and a report on the number of waste packaging items is delivered to the Fund.

The Centre has to place an identification label on every bale of pressed waste packaging, which contains data about the name of the Centre, identification number of the bale and mass of the waste packaging. When taking over, the recycler decodes the identification number, checks the mass and contents of the bale and enters the data into the database, which is the basis for filling in the Fund forms, which serve as the basis for the calculation of the compensation for the Centre and basis for issuing the invoice to the recycler. The Centres, i.e. the recyclers have to compress, bale the bags emptied of the packaging and deliver them to the company that recycles them and produces new bags.

### **5. CONCLUSION**

The system of collecting plastic, glass and Al/Fe packaging and payment of return compensation in the Republic of Croatia was introduced in 2006 and has been continuously improved since then. By establishing of a packaging waste management centres and by counting the packaging items at selling points and packing them in special-purpose bags provided by the Fund, the system control has been increased. But there is still room for improvement. For instance, it has been noted that the stickers are not of adequate print quality for this purpose, since there have been cases of code discolouring due to mechanical damage, rendering the barcode illegible for the barcode readers, especially in humid conditions.

Regarding plastic waste, in Croatia there are no significant activities of integrated plastics waste management so far – besides collection and recycling of PET-bottles. Although it was planned to start collection of all other waste plastics from households in 2009, a concrete strategy therefore is not to be foreseen. This is going to present a big challenge.

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