

Short communication

Current situation of scrap batteries in Turkey

S. Aktaş^a, A.A. Sirkeci^{b,*}, E. Açma^a

^a *Metallurgy and Materials Department, Chemistry and Metallurgy Faculty, Istanbul Technical University, Istanbul 34469, Turkey*

^b *Department of Mining Engineering, Mining Faculty, Istanbul Technical University, Maslak, Istanbul 34469, Turkey*

Received 15 May 2003; received in revised form 18 November 2003; accepted 24 November 2003

Abstract

This article reports the current situation of waste batteries and policies in Turkey. Turkey is a developing country where the battery consumption per person is around three to four pieces annually. Although the rate of consumption in Europe is around 10, the required amount of battery is growing rapidly with increasing technological development. According to the statistics of the year 2002, 10 million pieces of GSM batteries are consumed, whereas 250 million pieces of other sort of batteries are used in Turkey annually. Consumption figures suggest that the market value of the consumed batteries approximates to US\$ 200 million. Based upon the amount of the used battery and marketing values, it is estimated that 10,000 t of scrap batteries will accumulate per annum. Only 1.2% of scrap batteries in Turkey can be recollected through Istanbul Metropolitan Municipality. At present, there is no recycling plant in Turkey to recycle scrap batteries. In this investigation, the variety of batteries used, the situation of scrap battery collection and its capacity and also the possibilities of recycling of scrap batteries in Turkey are put forward.

© 2004 Elsevier B.V. All rights reserved.

Keywords: Recycling; Battery consumption; Economical aspects

1. Introduction

Turkey is a developing country where latest technologies are in widespread use and battery consumption increases accordingly. The increase in battery consumption is observed world wide including Turkey since batteries possess the merit of being handy and portable energy sources. In recent years, rapidly spreading use of cell phones, notebooks, and digital cameras have increased the demand for long-life, high-energy batteries. In highly developed countries, severe regulations are bringing the production, utilization, collection, and recycling of most of the chemical power sources under control [1]. For instance, in the year 1991, the Council of the European Economic Community (EEC) issued a special regulation regarding the disposal and recycling of batteries and accumulators containing hazardous materials [2]. According to a European regulation, all batteries must be regarded as hazardous wastes and thus they need to be treated prior to disposal. According to this, the tasks to be pursued are summarized as follows:

- Waste reduction at the origin by introducing cleaner products and processes;
- Recovery of valuables from wastes, where possible;
- Treatment of non-recoverable wastes for safe disposal [3].

Even though battery recycling is not a well-known concept in Turkey, she has to comply with the EU Directives, and therefore, we expect that battery recycling will become a well-established concept and the pertinent legislations will be issued in next a few years. It is anticipated that this work will contribute to the materialization of these legislations.

The battery consumption in Turkey is 250 million pieces per annum with about US\$ 30 millions turnover. The battery import of Turkey between 1992 and 2002 is presented in Fig. 1. The battery consumption per person is three to four pieces per annum whereas this figure is about 10 in Europe [4].

It is seen from Fig. 1 that the battery import sharply increased in 1996. It was due to the closure of a leading battery manufacturing company in 1995.

In line with the EU Directives, as of 1 June 2000 the use of batteries containing more than 25 mg mercury per unit has been prohibited throughout EU countries and Ministry for the Department of the Environment in Turkey announced that this regulation would come into force concurrently [5].

* Corresponding author. Tel.: +90-212-285-3011;

fax: +90-212-285-6128.

E-mail addresses: aktass@itu.edu.tr (S. Aktaş), sirkecia@itu.edu.tr (A.A. Sirkeci).

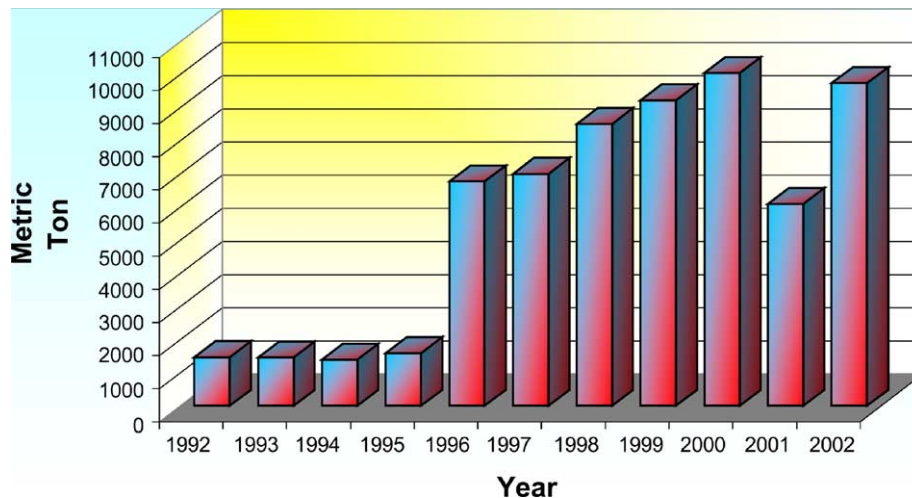


Fig. 1. Turkey's annually battery import by weight.

Alkaline and zinc carbon batteries used to constitute 10 and 90% of batteries sold in Turkish market, respectively. As the consumers become more conscious, the alkaline battery consumption rapidly increases. As of year 2002, the market share of alkaline batteries reached up to 30% [6]. In Turkey, there are approximately 21 million GSM users. Assuming that batteries of cell phones have an average life time of 2 years, approximately 600 metric tonnes of spent batteries accumulate with market volume around US\$ 150 million.

2. What has been done in Turkey so far?

In Istanbul, approximately 12 metric tonnes of spent batteries are collected per annum through about 1000 collection points and also upon request spent batteries are fetched from private sector on free of charge basis [7].

So far, there has been no recycling process initiated for spent batteries in Turkey apart from the work conducted by Istanbul Metropolitan Municipality for the collection of spent batteries during the last a few years. In the scope of this project, some schools were installed with waste battery collection units for encouraging the concept of battery recycling. Unfortunately majority of people in Istanbul are unaware of this work. The number of collection points is inadequate. Furthermore, since the collection points are perceived as litter cans by people they are generally abused and filled with rubbish.

The amount of batteries collected through the collection points in Istanbul are approximately 250 kg per week, which corresponds to about 1 metric tonnes of spent batteries per month. These collected spent batteries are transported to the waste treatment areas. For collecting waste batteries, two-chambered store with dimension of 5 m × 7 m × 5 m was constructed in the year 1998. The thickness of sidewalls made of reinforced concrete is 30 cm. The construction of the store was achieved by digging up the natural ground

5.5 m below the surface. Sidewalls and bottom of the first chamber were covered with 1.8 thick geo-membrane in order to prevent the emission that might take place as result of leakage of waste batteries. A special welding system was utilized in order to glue the contact lines of the membrane. The store is closed with steel lids [7].

After the first chamber is filled up, the second chamber will also be covered with the geo-membrane. What Istanbul Metropolitan Municipality initiated can be regarded as a good start at first sight, but it is rather inadequate when compared with the applications executed by EU countries regarding battery recycling.

3. What should be done in Turkey at present?

The steps that should be taken for performing the recycling of the waste batteries can be summarized as follows:

- The studies made by the EU countries in this matter should be made known to the people and people awareness should be promoted. Also the below mentioned points should be pointed out to the knowledge of people.
 - The waste batteries have hazardous effects on human health and environment.
 - The leakage from the waste batteries damages devices.
 - The recycling of waste batteries contributes to the national economy.
- All nationwide municipalities should ensure that consumers dispose of their spent batteries safely into the collection containers in their neighborhood.
- These spent batteries should be collected on regular basis and forwarded to the main collection units.
- The collected waste batteries should be classified based on their contents.
- Valuable metals contained in the waste batteries should be recovered by hydrometallurgical and/or pyrometallurgical methods.

To sum up, the recycling of waste batteries in Turkey can be successfully initiated by the awareness of people and a collective work rather than by the individual efforts. Without creating people awareness and a nationwide contribution of people, recycling cannot be put into life. Thus, people's participation is an indispensable element of this process and should be supported by the media and government. The importance of this issue should be broadly emphasized in the media. In addition, recycling concept should be put into national curriculum as a lesson starting from elementary schools.

4. Conclusions

Over 10,000 metric tonnes of spent batteries are discarded per annum in Turkey, and unfortunately, only approximately 1.2% thereof is collected by Istanbul Metropolitan Municipality and deposited in the above-mentioned stores awaiting to be recycled. It is evident that Turkish people are not conscious in this matter yet open to new concepts when pro-

motivated by media and government. It is believed that recycling process will come into life after achieving nationwide awareness of people.

Acknowledgements

The authors would like to thank Istanbul Metropolitan Municipality for the data kindly provided.

References

- [1] J. Keri, J. Precsko, *J. Power Sources* 53 (1995) 297–302.
- [2] A. Muzi, *J. Power Sources* 57 (1995) 19–21.
- [3] M. Contestabile, S. Panero, B. Scrosati, *J. Power Sources* 83 (1999) 75–78.
- [4] State Statistics Institute Data.
- [5] D. Gazetesi, 18 July 1996 (Turkish Weekly Financial Newspaper).
- [6] D. Gazetesi, 1 May 2000 (Turkish Weekly Financial Newspaper).
- [7] Istanbul Metropolitan Municipality Private Interview.