

Recovery of Waste Electrical and Electronic Equipment (WEEE) in Finland

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Abstract

In this article, the EU Directive on Waste Electrical and Electronic Equipment (WEEE) and its impact on Finnish waste management as related to WEEE will be discussed. This paper also describes the project of the Technology Industries of Finland known as AWARENESS, which focuses on how the WEEE directive influences the manufacturers and producers of electrical and electronic equipment in Finland. In the final section of this paper, the current situation of WEEE recovery and recycling in Finland, especially in the Northern Ostrobothnia, is introduced and discussed.

Keywords: WEEE Directive, AWARENESS project, WEEE recovery, WEEE recycling, Northern Ostrobothnia

1 Introduction

Waste production appears to be an inevitable consequence of material well-being and high levels of consumerism. Wastes represent an enormous loss of material and energy resources in the developed world, e.g. the EU. As a result, the European Community has an environmental policy with the main objectives being to preserve, protect and improve the quality of the environment and human health as well as utilizing natural resources judiciously. Additionally, the Community programme of policy and action in relation to the environment and sustainable development states that the achievement of sustainable development calls for significant changes in current patterns of development, production, consumption and behaviour. It also demands the reduction of wasteful consumption of natural resources and the prevention of pollution. To meet these objectives and ambitions, the EU has enacted a wide range of legislation to contribute to sustainable waste management and use it as a key force for change (2002/96/EC).

Waste from electrical and electronic equipment (WEEE) is one of the priority waste streams in EU waste management policy because of its major challenges. It is expected that quantities of WEEE will increase rapidly in the near future. Currently, WEEE constitutes 4 % of municipal waste in the EU. However, it is estimated that the amount of WEEE increases 16 - 28 % every year, which means a growth rate three times as fast as average municipal waste. Some parts of the Electrical and Electronic Equipment (EEE) market, e.g. TV sets and washing machines etc., are showing signs of saturation; whereas many other areas show significant growth. For instance, IT and telecommunication equipment as well as electronic toys are good examples of the dynamic growth area of EEE market. Challenges faced by WEEE management are not only consequences of growing quantities of waste but also the complexity of WEEE: It is one of the most complex waste streams because the wide variety of products from mechanical devices to highly integrated systems and accelerating technological innovations. (EEA, 2003.)

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Due to the aforementioned reasons, EU legislation presently also includes electrical and electronic equipment: The European Parliament and Council have implemented two Directives now related directly to EEE. The Directive on the Restriction of the use of certain Hazardous Substances (RoHS) in electrical and electronic equipment seeks to approximate the laws of the Member States on the restrictions of the use of hazardous substances in EEE, and to contribute to the protection of human health and environmentally-sound recovery and disposal of WEEE. (2002/95/EC) The second is the directive on waste electrical and electronic equipment (WEEE).

2 The Directive on Waste Electrical and Electronic Equipment

The Directive on waste electrical and electronic equipment (WEEE) primarily aspires to prevent the waste of electrical and electronic equipment. It also requires the re-use, recycling and recovery of such wastes to reduce disposal of such wastes. Furthermore, it seeks to improve the environmental performance of all operators involved in the life cycle of electrical and electronic equipment, such as producers, distributors and consumers. (2002/96/EC.)

Initially, the term ‘electrical and electronic equipment’ should now be specified. In the WEEE Directive, electrical and electronic equipment is defined as being equipment that is dependent on an electric current or electromagnetic field to function, and equipment for the generation, transfer or measurement of such currents and fields. The voltage rating to which that applies ranges from 0-1000 V for AC and 0-1500 V for DC. (2002/96/EC.)

The WEEE Directive has ten categories of electrical and electronic equipment and they are categorized as follows (2002/96/EC):

1. Large household appliances (e.g. refrigerators)
2. Small household appliances (e.g. coffee machines)
3. IT and telecommunications equipment (e.g. computers)
4. Consumer equipment (e.g. radio and television sets)
5. Lighting equipment (e.g. fluorescent lamps)
6. Electrical and electronic tools with the exception of large-scale stationary industrial tools (e.g. drills and saws)
7. Toys, leisure and sports equipment (e.g. video games)
8. Medical devices with the exception of all implanted and infected products (e.g. radiotherapy equipment)
9. Monitoring and control instruments (e.g. smoke detectors)
10. Automatic dispersers (e.g. for hot drinks or monies).

To achieve the objectives of the WEEE directive, it makes wide-range demands on producer responsibility, collection of WEEE from households, treatment of WEEE and information directed to consumers.

3 The Technology Industries of Finland and the AWARENESS-project

The Technology Industries of Finland is a registered association with its mission being the Finnish technology industries’ competitiveness in the global marketplace. It is also a forum that enables efficient co-operation and networking on local, regional, domestic and international. (Teknologiateollisuus 2004.)

The Technology Industries of Finland’s ongoing project, AWARENESS (Advanced WEEE recovery and recycling management system), introduced in Summer 2003, focuses on influences of the WEEE directive on the manufacturers and producers of electrical and electronic

equipment. The goal of the project is to support companies in arriving at a consensus on directive implementation details. In addition, the project aims to initiate company co-operation in different product categories and to take optimal recycling processes into use. The Internet-based information system will be also developed during the project and it will be designed to meet the information and reporting obligations of the producers of electrical and electronic equipment imposed by the WEEE directive. (Malmström *et al.* 2004.)

The AWARENESS project consists of two sub-projects called SELMA and RecISys. SELMA focuses on managing issues related to operational recycling and carrying out communication between national authorities and companies. Electronics manufacturers and producers, recycling companies as well as the Ministry of the Environment are participants in the SELMA project. In addition, co-operation between project participants and major constituent groups, such as municipalities and the waste management sector, is promoted. In the other sub-project, RecISys, the main objective is to develop the Internet-based information system, which will meet the information needs of WEEE and RoHS directives. Controlling the operation of recycling processes, reporting to the authorities as well as informing customers and the recycling industry will be done through this information system. (Wiik 2004, Malmström *et al.* 2004.) A tentative schedule of the AWARENESS project is illustrated in the Figure 1.

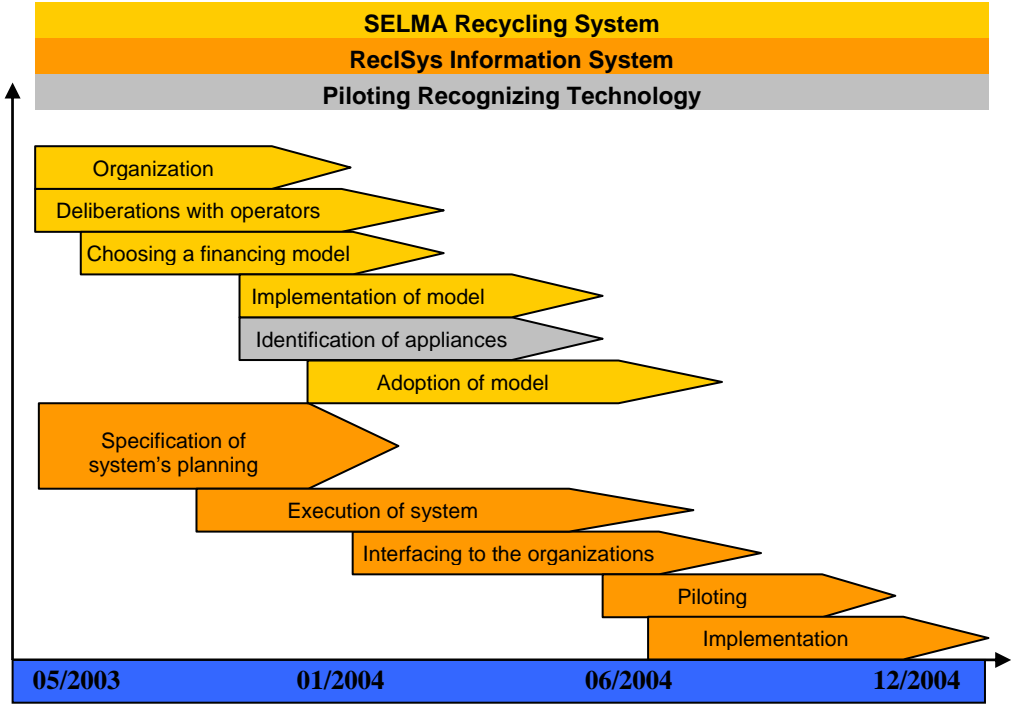


Figure 1 Technology Industries of Finland: Tentative schedule of the AWARENESS project (Teknologiategollisuus ry 2004).

In the operations part of the AWARENESS project, six working groups of product categories were formed. These categories were chosen so that the created operations models for them can be easily modified to all other categories at a later date. At this phase of the project, working groups are planning respectively different realization alternatives of producer responsibility for the product categories. The viewpoints of the groups are aggregated in the advisory board, where common decisions, conclusions and applications related to these issues are made. There has been much discussion on issues related to heterogenic composition of the WEEE stream, for example, by the use of different recovery and recycling methods as well as the need of independent and collective treatment of professional appliances. (Wiik 2004.)

During the course of the AWARENESS project, the developing recycling system is compared to similar ones in Sweden and Norway, where national legislation of WEEE was implemented quite recently as well. The objectives of comparison are to attain information for experiences, advantages and disadvantages and to utilize that information during the development of the Finnish WEEE recovery and recycling system. (Wiik 2004.)

4 WEEE recovery and recycling situation in Oulu region Finland

The lack of national legislation necessitates the situation where the WEEE recovery and recycling system will be built based on estimates and reference data of other countries. For instance, the amount of WEEE in Finland for 1996 was estimated to have been 94,000 tonnes (SET 1995). Considering the estimated growth rate of 3 - 5 % per year (EEA 2003), the total amount of WEEE in 2003 can be extrapolated to be 120,000 tonnes. However, the estimation of the amount of WEEE based on reference data from Sweden and Norway is 100,000 tonnes per year. The estimates of WEEE recovery in Finland are even more rough because it is voluntary for the operators to report and publish such data. (Wiik 2003.)

For major consumer products, a high proportion of discard metal-rich large household appliances such as refrigerators, kitchen stoves and washing machines are already recycled. Similarly, precious metal based products, such as integrated circuit boards of personal computers and mobile phones, have also been targeted for recycling, as the precious metal content provides an economic driving force for recovery (Cui and Forsberg, 2003). The UK based Industry Council of Electronic Equipment Recycling estimates that, in the UK, some 50% of discarded consumer electronics are being processed via some form of recycling (ICER, 2003). During Autumn 2003, a mapping of WEEE recovery and recycling organizations in Northern Ostrobothnia was performed to determine, has Finland already achieved the 4 kg/person/year recovery target. Several WEEE operators in the recovery business operate in the area, but only a few that also treat recovery locally. Habitually, WEEE is collected and pre-treated in Northern Ostrobothnia and transported elsewhere for the actual treatment and materials utilization.

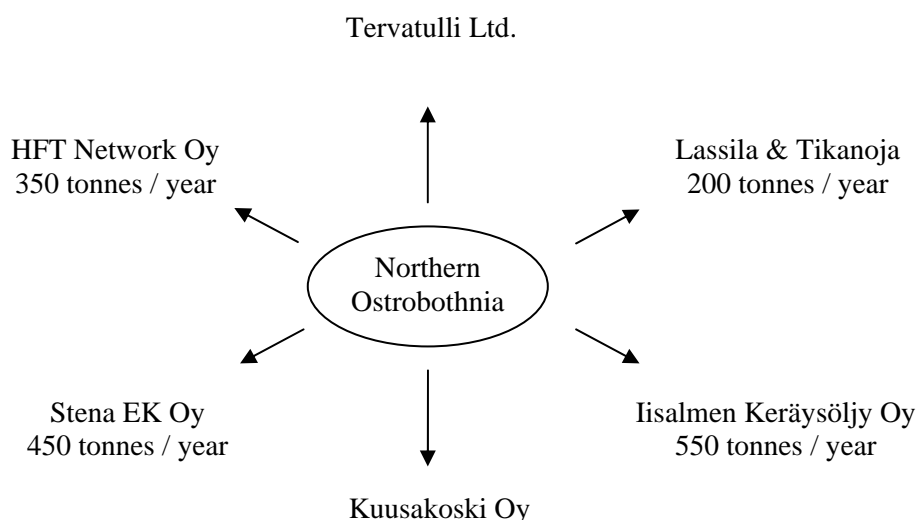


Figure 2 Recovery of WEEE in Oulu region in 2002.

Currently, six major companies operate WEEE recovery business in or near Oulu. Offices and educational institutes, such as our university, would generally have a contract with one of these firms to remove and take care of their electronic equipment. Individual citizens can take their

equipment to designated reception places. The Oulu Waste Management Company receives electronic waste at their landfill site. Most of the electronic goods retailers also take back old electronic equipment in association with buying a new one. Most of the time, a discard fee has to be paid. There are great variations in these fees, from 1 to 36 euros, with refrigerators' "Freon-removal fees" being higher. In the following, the major electronics recycling operation in or near Oulu are introduced.

HFT Network Oy

HFT Network Oy is a member of Proventia Group. Their services include information management systems and advisory services as well as plants and systems for recycling electronics waste, computer screens and mobile phones. (Proventia 2004.)

HFT Network Oy has a WEEE treatment plant in Oulu, where approximately 350 tonnes of WEEE is treated per year. The bulk of WEEE is pre-treated by others; for example, Tervatulli, and HFT Network focuses on the actual treatment. Recovered materials from WEEE are then supplied back to the industry. For instance, plastics and glass are sold to Germany, metals are utilized by Outokumpu Oyj, and hazardous wastes are supplied to Ekokem Oy in Riihimäki, both in Finland. (Holappa 2003.)

Tervatulli Ltd.

Tervatulli Ltd. is non-profit corporation, the firm was founded in 1997 to improve the employment situation of people with hearing impairments living in the Oulu area. Its line of business includes recycling of household appliances and electronic equipment, engineering on order, cleaning services and small-scale building. Their WEEE recycling services are used mainly by companies and associations, but also by the private sector. Tervatulli Ltd reprocesses WEEE and supplies it forward, e.g. to HFT Network Oy who does the actual recycling (Tervatulli 2004).

Iisalmen Keräysöljy Oy

Iisalmen Keräysöljy Oy is a part of the Ekokem concern and it offers special waste management services to municipalities, companies and to the private sector in the whole area of Central Finland. The collecting plant is located in Iisalmi, where wastes are pre-treated. Pre-treated WEEE is transported and treated at Maaninka. The recycling plant treats approximately 550 tonnes of WEEE per year. The treated WEEE consists of mainly refrigeration devices (40 - 50 %) and TV sets (30 - 40 %). Most of the WEEE, going to the Iisalmen Keräysöljy Oy centre, comes from municipal waste management or store chains, and also from the private sector. (Turunen 2003.)

Lassila & Tikanoja (L&T)

Lassila & Tikanoja has a toxic waste disposal plant in Haukipudas (adjacent to Oulu). This plant also receives approximately 200 tonnes/year WEEE from northern parts of Finland. Most of the WEEE received comes from municipal waste management and industry. WEEE is then transported as such to Kerava in southern Finland.

In Kerava, Lassila & Tikanoja have a WEEE treatment plant. WEEE is there sorted and pre-treated into several fractions, e.g. metals, cables and hazardous wastes. A portion of WEEE is then redirected to a third party, who re-uses or utilizes them as whole equipment. Cooking

ranges, monitors and TV set are examples for this kind of wholly utilized equipment. Other WEEE is then utilized by L&T as a material or energy in Finland and Europe. (Tanskanen 2003.)

Stena EK Oy

Stena EK Oy is a part of Stena Metall concern, and Stena EK treats approximately 450 tonnes/year in WEEE in Pietarsaari and Uusikaarlepyy in Ostrobothnia. The treated WEEE consists mainly of control and memory devices as well as data processing equipment, which comes from industry. Materials from WEEE are utilized in different ways: metals, such as copper, aluminium and ferrometals, are supplied back to the industry, plastics can be incinerated or recycled mechanically and supplied to industry, and glass is divided into recycled and hazardous waste. Recyclable glass is returned to industry, whereas hazardous glass is transported to the toxic waste disposal plant. (Luukkonen 2003.)

Kuusakoski

Kuusakoski is one of the world's 15 largest metal recycling facilities, in 2002 it employed 1800 people. WEEE collected from citizens at Oulu Landfill site, or from electronics retailers are generally transported to Kuusakoski. From their yearly material throughput of 2 million tons, it would be impossible to determine what fraction of it is coming from Oulu. Nonetheless, Kuusakoski reported that in some areas of the foundry they have already surpassed the WEEE directive requirement of 4 kg/person/year, and achieved 6 kg /person /year of electronic waste recovery. (Kuusakoski 2002.)

5 Discussion

Due to lack of data, only very rough estimates can be made about WEEE recycling percentages. We can only estimate that an excess of 1500 tonnes of electronic waste are recovered in Oulu region. Oulu region has 457 308 inhabitants, Oulu's population is 124 500 (Source: Statistics Finland 2003). Nobody can make conclusions based on these data; nevertheless, some electronics recyclers share the feeling that Oulu also might have already achieved the EU electronic waste recovery target.

At the present stage, discussions about wording of the Finnish decree continue. In the same time no decision has been made regarding establishing and financing these systems. During these discussions it was suggested that retail shops continue to take back old equipment when buying a new one. The advantage is that retail shops are already prepared for handling electronic equipment and their personnel is educated about handling electronic equipment. However, the retail association resists this solution, and requests a mention in the Finnish regulation that retail shops are not obligated to accept WEEE. (Ilmola 2003.)

6 Conclusions

The waste from electrical and electronic equipment (WEEE) is one of the priority waste streams in EU waste management policy because of its major challenges. Due to the fact that the quantities of WEEE are expected to increase rapidly in the near future, the European Parliament and Council have implemented two Directives related to electronics: The Directive on the restriction of the use of certain hazardous substances in the electrical and electronic equipment (RoHS) and the directive on waste electrical and electronic equipment (WEEE). The WEEE directive aims to prevent WEEE and it requires re-use, recycling and recovery of such wastes to reduce the disposal of waste. To achieve the objectives of the WEEE directive, it places a broad

range of demands on producer responsibility, collection of WEEE from households, treatment of WEEE and information to consumers.

Due to the lack of national legislation, The Technology Industries of Finland runs a project called AWARENESS (Advanced WEEE recovery and recycling management system) focusing on influences of the WEEE directive on the manufacturers and producers of electrical and electronic equipment. The aims of the project are WEEE recovery, the recycling system as well as internet-based information systems being built in Finland.

The WEEE directive provides that national legislation related on waste electrical and electronic equipment should be implemented before August 13, 2004. In addition, separate collection is the precondition to ensure specific treatment and recycling of WEEE, and suitable waste management facilities will have to be developed for the acceptance of WEEE by August 13, 2005. (2002/96/EC.)

It is generally estimated that all member states of the EU cannot reach the requirements under the indicated schedule. For instance, it is assessed that national regulation and legislation will be fall behind schedule in Spain, Germany and Sweden even though the ability for practical operation already exists. The opposite situation most likely exists already in Ireland and France, where regulation will be prepared before August 13, 2004, but the operational preconditions will not be ready in the duration of the transition period. (Wiik 2004.)

In the case of Finland, the proposal of national regulation and legislation was introduced in April 20, 2004 and it will be implemented at the latest September 01, 2004. That means that the WEEE regulation, which fulfils the obligations of the WEEE directive, will be implemented in the duration of the transition period in Finland. (Laaksonen 2004.)

However it has been evaluated in the UK that from the recycling of large EEE, with a high percentage and/or volume and valuable metals' containing equipment the 4 kg/person/year is already achieved.

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