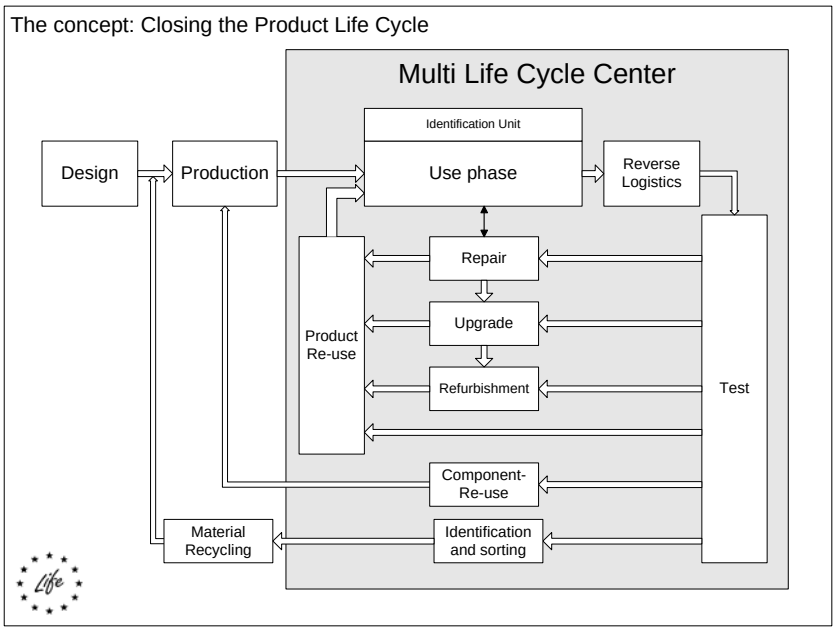
The Multi Life Cycle Center for electric and electronic equipment

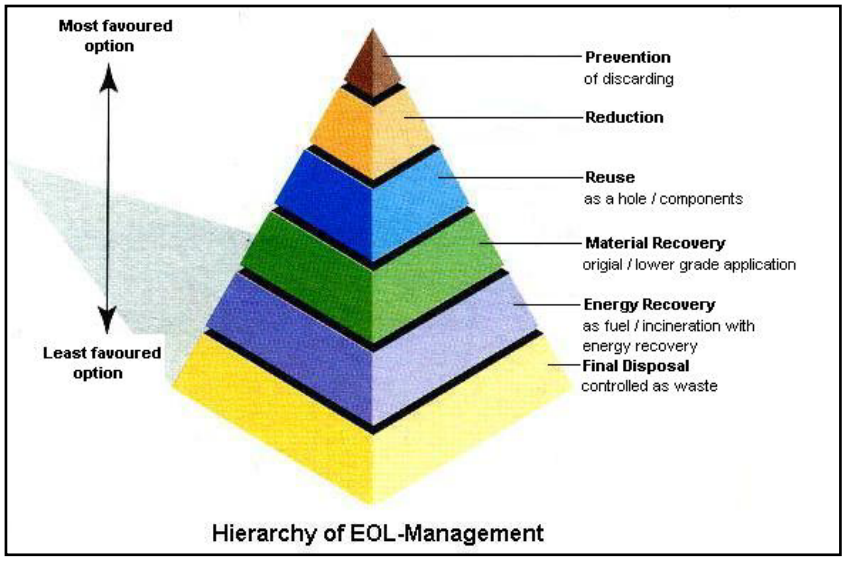
LIFE04 ENV/AT/000007

Overview of the project

During this demonstration project a highly innovative re-use und recycling system for Waste from Electrical and Electronic Equipment (WEEE) has been implemented for the first time. It makes use of the latest developments in automation and information technology in order to achieve the most efficient process.



The Multi Life Cycle Centre follows the philosophy of recovering WEEE at the highest level, starting with re-use of the whole product down to the subassembly and component level and finally to the recycling of materials.



This approach is worldwide unique and therefore the goal was to prove that an eco-efficient (=ecologically as well as economically efficient) re-use of WEEE on large scale is working by using highly sophisticated technologies.

Background of the project

In the European Union, electro-scrap is the fastest growing waste stream, growing at 3-5 % per year. The Directive 2002/96/EC on waste electrical and electronic equipment (WEEE) along with the complementary Directive 2002/95/EC on the restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS) seeks to reduce the environmental impacts of WEEE throughout all stages of the equipment's lifecycle, particularly at the end-of-life stage, by encouraging the end-of-life management of the product, eco-design, life cycle thinking and extended producer responsibility. The transposition of the WEE Directive was due before 13 August 2004.

Product re-use

The most efficient and environmentally friendly way of treatment for electronic waste is the re-use of the product as a whole. This becomes possible, if the product is not yet completely outdated an in good overall condition. Personal computers in big companies, for example, usually are replaced every 3 to 5 years, while they can still be useful for a lot of purposes from text processing up to surfing the internet.

The only problem with that is that the condition of a given device cannot be judged just by regarding the exterior of that product, but some more extensive testing has to be done.
In the case of personal computers we employ a testing algorithm that ensures that the “inner workings” of the given device are OK so that they can be expected to work productively for their “second owners” as well.

The same procedure applies also to mobile phones, which are usually not scrapped by their former users because they are not working any more but because the user is switching to a newer model.

STENA

Testprotokoll PC

Nur auszufüllen wenn PC-Test = OK!

Hersteller: Compaq
Typ: 8327 (Desktop)
Lieferung: 329-07

Zustand:

	OK	refurbish
Gehäuse außen	☒	☐
Gehäuse innen	☒	☐
Festplatte	☒	☐
RAM	☒	☐

10.08.2007
Datum

Bearbeiter

Repair, refurbishment and upgrade

A lot of products reach our facility in a condition that does not allow immediate re-use for various reasons:

- Dirty or lightly damaged cases
- Missing parts
- Lack of state-of-the-art interfaces or ports
- Dust or dirt inhibiting or threatening proper function

After an initial test and an computerized lifetime prediction algorithm our operators decide, whether repair, refurbishment or upgrade of such products is feasible. If it is, we first open the device to clean it internally with a blast of compressed air. After that missing parts are replaced (mostly from our stock of parts acquired from scrapped products) - e.g. computer memory that has been removed by the former user before scrapping the device.

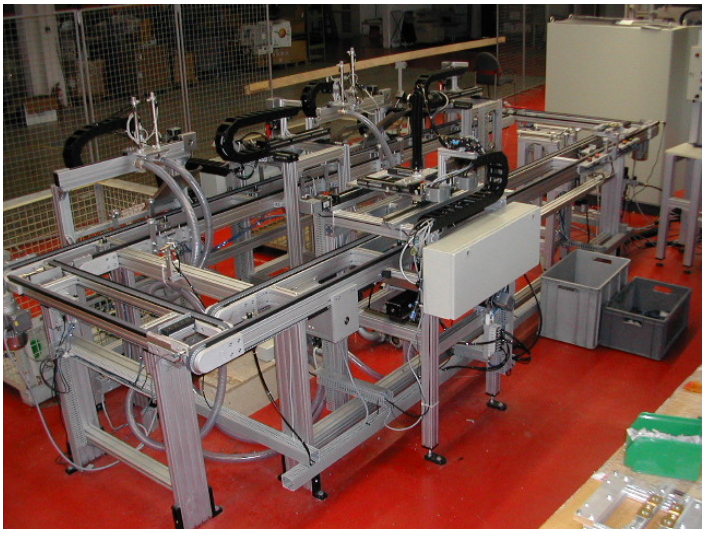
If the device contains a hard-disk or other non-volatile memory possibly containing personal data of the previous owner these are erased thoroughly using industry-strength disk wiping programs.

If the product lacks interfaces or ports that are called for by customers of re-used products (e.g. network interface, USB) these can also be added.

As a final stage the case is cleaned thoroughly and stickers, blotches and small scratches are removed. After that the product is ready for re-use.

During the Life-Project we were able to refine our testing procedures, so that the results are much more reliable. This saves a great amount of time with every device we are testing.

Component re-use

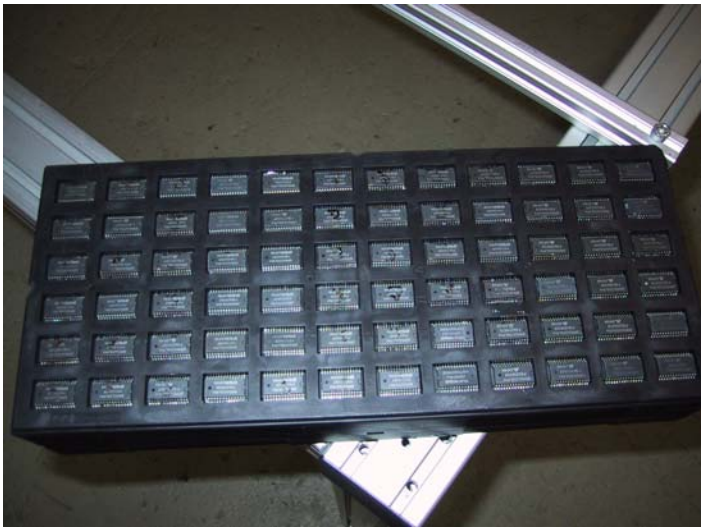


If neither the re-use of the product as a whole nor repair or refurbishment are economically feasible, the next best thing is to extract valuable components and re-use them while scrapping the rest of the product.

At our facility in Vienna we are currently operating two production lines for that purpose:

The first line is designed to automatically dismantle mobile phones so that valuable parts like the LCD displays which are much looked-for spare parts, as well as hazardous waste requiring special treatment, can be extracted and re-sold respectively treated in an environmental way.

The second line is used to de-solder and remove electronic components directly from printed wire boards. Thus valuable components can be extracted automatically at a low cost.



The possibility of component re-use basically depends on the following factors:

- Product age
- Overall condition
- Market situation
- Cost of extraction
- Remaining lifetime prediction

The Life-Project allowed us to “industrialise” both disassembly lines resulting in a significant speed-up in case of mobile phone recycling (the throughput of our line nearly doubled) due to more efficient control algorithms.

For the de-soldering line we demonstrated a new temperature control unit that increased the overall throughput as well as the quality of the extracted components by reducing the risk of temperature damage.

Material recycling

Products that cannot be re-used as a whole or component-wise still contain valuable and/or hazardous materials. To obtain these the product has to be taken apart.

In most cases this is done by manual labour.
The case is opened, and the different parts are removed from it.

Several fractions are collected separately:

- Cathode ray tubes (glass)
- Printed circuit boards
- Plastics (different types and colours)
- Iron
- Wood
- Batteries
- Electrolytic capacitors

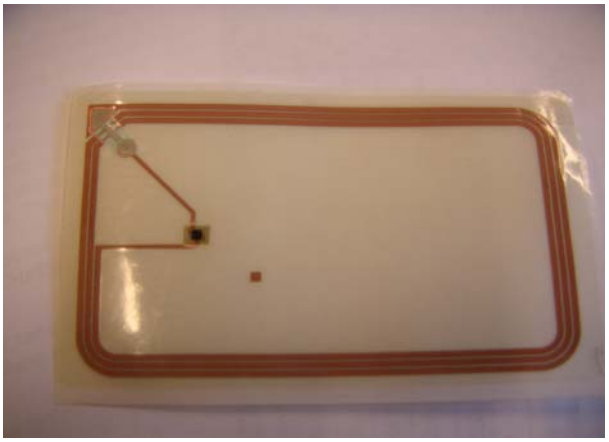
These fractions are sold to material recyclers who do the further treatment.

The glass of cathode ray tubes is sold to a specialist, where it is cleaned and separated so that new CRTs can be produced.

Printed circuit boards contain significant amounts of copper as well as several precious metals. These contents are extracted by copper smelters.

The plastic fractions (mostly cases) can also be recycled, if some care is put into the separate collection of different materials and colours.

Reverse logistics



Another goal during the Life-project was to test and demonstrate a novel logistics concept for our recycling business. Ideally it should become possible to track a certain container on its way from the collection point to our facility where it undergoes its End-of-Life treatment.

A possible, innovative solution for this tracking are RFID (**R**adio **F**requency **ID**entification) - tags, inexpensive electronic circuits that can be read without physical contact through the use of electromagnetic waves (radio band).

RFID is supposed to make today's identification technologies like barcodes or the like obsolete within several years in production and retail – and most likely also in end-of-life processing.

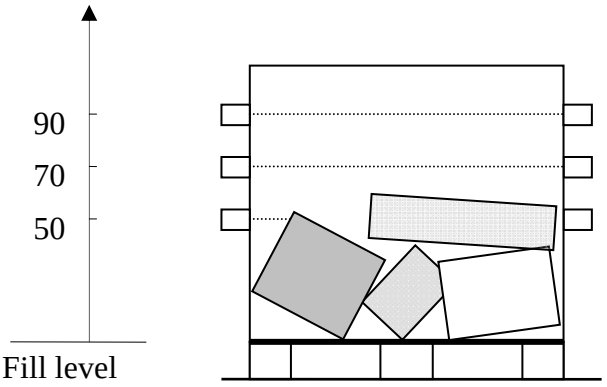
The RFID tags can be placed on any container. Handling devices like forklifts as well as gates or loading ramps can be equipped with RFID-readers. Thus it becomes possible to determine the exact location of a given pallet or container at any time.

The use of RFID in logistics also allows some automation of the sorting and disassembly process as tasks like weighing, accounting, storage and so on can be carried out using a central database instead of individual documents for every container.

We implemented a RFID test environment at our plant where we were able to evaluate the risks and the benefits of this new technology for our business. We also kept close contact with the operators of collection points on whether they would participate in such a logistics system.

Information management and WEEE reporting

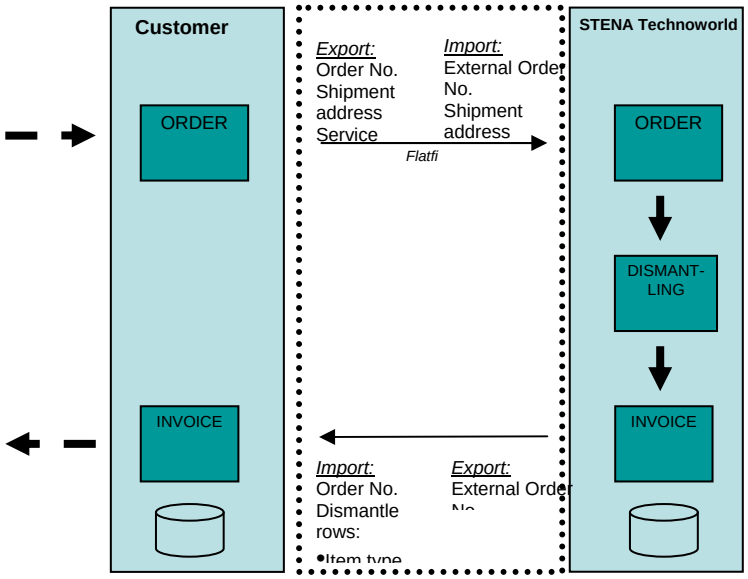
While the last task (RFID system) mostly dealt with the hardware to properly identify and track products on our site and beyond, this task dealt with the necessary software and procedures to increase efficiency and to meet the requirements by legislators and government bodies.



This involves automated reporting of the fill level of our collection containers, optimized tour planning for the collection trucks, weighing, stock management, management of test data, remaining lifetime calculations, generation of reports and statistics, accounting and many more.

We finally came up with the following requirements for our in-house information system:

- Balancing the weights of incoming and outgoing products and materials
- Managing the necessary transportation documents as well as notifications
- Determining the re-use, recycling and recovery quota
- Tracking the order fulfilment of each individual delivery
- Receiving orders and writing invoices automatically
- Managing our collection devices and our internal ware house
- Automatic reporting to our customers as well as to national authorities
- Integration of our scales, test databases and automated lines



This led to the decision to use the “Navision” ERP-system as an information system.

For business customers we provide an easy web-based interface that allows them to schedule pick-ups for their waste containers.