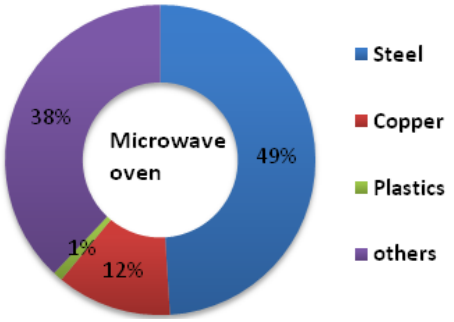
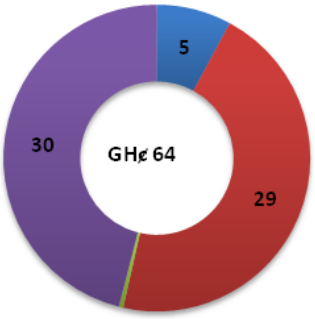
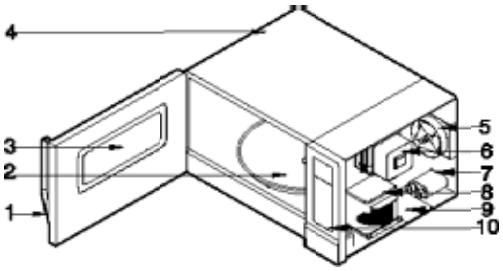
Material Composition



Scrap Value In Agbogbloshie



Microwave



1. Handle
2. Turn plate
3. Glass window
4. Steel Covering
5. Fan
6. Magnetron
7. Capacitor
8. Transformer
9. Circuit Board
10. Timer Display

Microwave Overview

Common brands:
Emerson, general electronic (GE), LG, Magic chef, Panasonic, Sanyo, Samsung, and Whirlpool*.

Hazardous materials:
Beryllium (Be), lead (Pb), polychlorinated biphenyl (PCB)

Key components/parts:
Capacitor, transformer, magnetron, circuit board, fan and cavity.

Primary materials:
Copper, glass, steel.

Types:
Commercial, convection and built-in microwave ovens

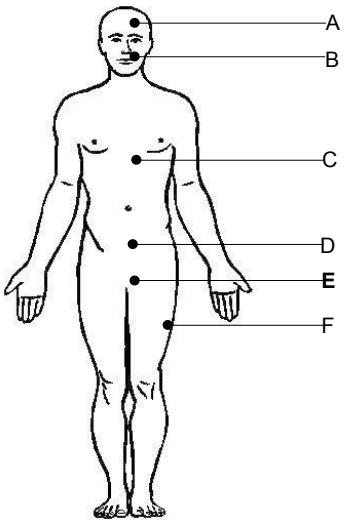
Weight Composition: 12% Cu, 1% glass, 1% plastic, 49% steel

⚠ The high voltage capacitor is charged and lethal. Steps should be taken to discharge it before disassembly.

Urban Mining

Copper can be extracted from various parts of the microwave such as the cables and the anodes in the magnetron. The main body is made up of stainless steel and the microwave door has a glass window which keeps the waves in the chamber and prevents them from escaping, since they can be harmful to humans. In some microwaves, the turning plate is made up of glass, which offers various opportunities for extraction. There is also a fan which blows out the hot air from the chamber. This is made up of plastic. The market for scrap parts include metalwork industries and local community makers. The steel outer covers are perforated and used in Agbogbloshie to make cooker grills.

Health



A. Nervous System
B. Respiratory system
C. Immune system
D. Urinary system
E. Reproductive system
F. Bone

Hazardous Material

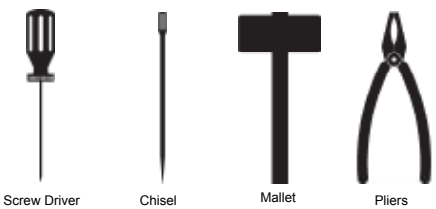
Beryllium (Be) - Pneumonia, lung damage, increased cancer risk and DNA damage.
Lead (Pb) - Anaemia, kidney and brain damage, infertility (in men and women), cancer, headache and behaviour disruption of children.
Polychlorinated biphenyl (PCB) - Liver & immune system damage, cancer, damage to the nervous system, and infertility.

Safety Gear

The disassembly process exposes the worker to various levels of potential harm. Disassembling a microwave requires protective gear to reduce risks of electrocution, inhalation of toxic chemicals such as beryllium oxide. Depending on scale and/or volume, hazmat suits, which are full garments with footwear and masks, may have to be worn to protect e-waste workers from dangerous chemicals.

Tools For Disassembly

The tools required for processing are: chisel, hammer, pliers, screw drivers, wire cutters.



Tools are essential to the process of disassembly and are the primary means by which industrial activities are carried out. Not all the tools listed above are used in the process of disassembling refrigerators. The most commonly used ones are the mallet, the chisel and the screw driver. Out of these, the mallet and the chisels are made in Agbogbloshie by local blacksmiths.

⚠ **Tools are a potential source of injury. The risk can drastically be minimised by using the right tool for the right job. In the process of disassembling microwaves, the highest risk to workers especially in Agbogbloshie is the relatively lower risk of swallowing screws.**

Step by Step Disassembly

1. The take out the housing, by detaching all the screws at the joints.
2. All the interior components can be removed by cutting off the connecting wires.
3. The transformer, capacitor, diode, magnetron can be taken out separately. Be careful of the ceramic beryllium oxide layer (pink colour).
4. The circuit board which consists of resistor, fuse, and inductors can also be taken out by cutting off some connecting wires.
5. Unscrew the other joints to take out the timer and the small motor under the food tray.
6. After disassembly, components should be documented via labelling and photography.


Microwave


Casing


Magnetron

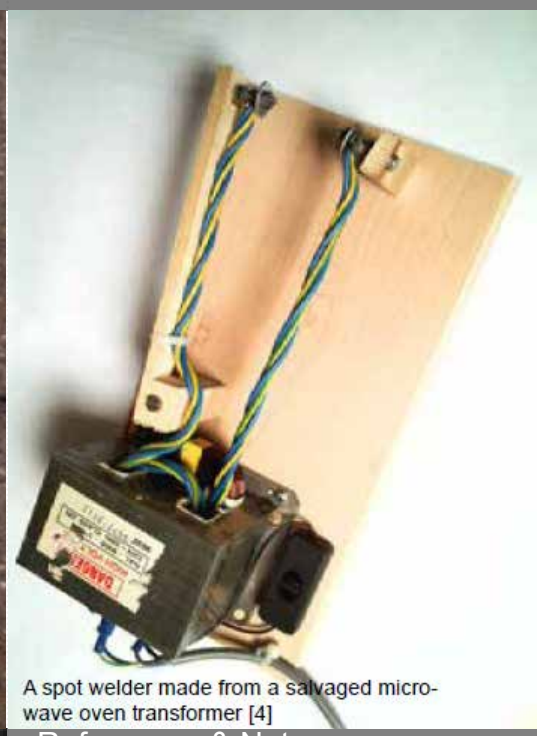

Transformer


Fan

Re-make

There are several parts in a microwave that can be re-used. The fan can be reclaimed for several cooling devices and standing fans. Usually, the transformer is still in good shape and can be used in various devices where some form of power supply is needed. In the images shown here, there is a standing fan where the blades are from a microwave. The spot welder is also made from a transformer, salvaged from a microwave.

An indoor cooling fan, made from a salvaged microwave fan & motor [3]



A spot welder made from a salvaged microwave oven transformer [4]

Made in Agbogbloshie

Microwave oven scrap used as seats during work sessions in Agbogbloshie.

References & Notes

1. http://www.microtechfactoryservice.com/images/FigPart3.gif
2. http://hyperphysics.phy-astr.gsu.edu/hbase/waves/mwoven.html
3. http://www.lenntech.com/periodic/periodic-chart.htm
4. http://www.epa.gov/ttn/atw/hlthef/vinylchl.html

***Calculation on estimated value:**

Prices of materials vary in Agbogbloshie depending on the local market. Also the state of the materials also influences the price, that's the price of burnt copper differs from that of the unburned by 1 Ghana cedis per pound. In Agbogbloshie, copper and aluminium are weighed in pounds (lbs) and iron/steel is weighed in kilograms (kg). The prices we used in this calculation are that charged as at July, 2014.

Calculation inputs:
Total weight of equipment (W): 35 kg
Weight percent of material (W%): %
Weight of material (Wm): W% * W:
Price per material = Wm * amount in GHC per kg
(1 kg = 2.204 pounds)

** These types of EEE are mostly found and dismantled in Agbogbloshie.

For more information, visit:
http://qamp.net/microwave oven

What is a Microwave

A microwave oven is an electronic household appliance that provides the features for cooking, and reheating food by using high frequency electromagnetic (EM) radiation.

How it works

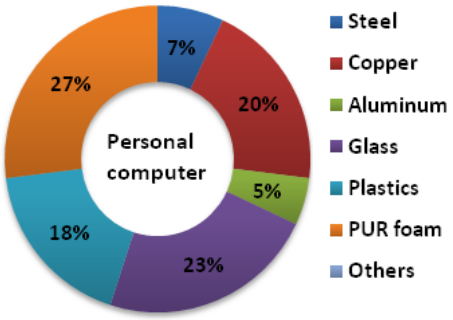
A microwave has three main parts: the chamber, the wave-guide and the magnetron. It works when the magnetron generates electromagnetic (EM) radiation, which the wave-guide directs to the food in the chamber. The food heats because the wave absorbs the water molecules, oils, and certain other molecules from it. The chamber where the food is placed helps to hold the high energy produced and prevents it from causing harm to the user.

Microwave Oven

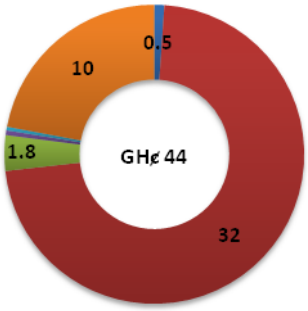
AMP

Agbogbloshie Makerspace Platform

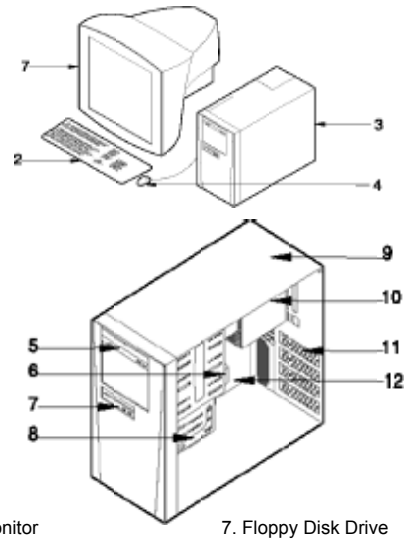
Material Composition



Scrap Value In Agbogbloshie



Computer



1.Monitor
2. Central Processing Unit
3. Keyboard
4. Mouse
5. CD ROM
6. Hard Disk
7. Floppy Disk Drive
8. Power Supply
9. Stainless Steel Case
10. Power Pack
11. Vents
12. Mother Board

Computer Overview

Common Brands:
Acer, Apple, Asus, Dell, Fujitsu, HP, IBM, Lenovo, Medion, Sony, Toshiba*

Hazardous Materials:
Beryllium oxide (BeO), cadmium (Cd), hexavalent chromium (Cr VI), lead (Pb), sulphur (S)

Key components/parts:
Case, central processing unit (CPU), hard drive, monitor, motherboard, power supply random access memory (RAM)

Primary materials:
Aluminium (Al), copper (Cu), glass, gold (Au), iron (Fe), plastic

Types:
Desktop, Laptop, Notebook, PC

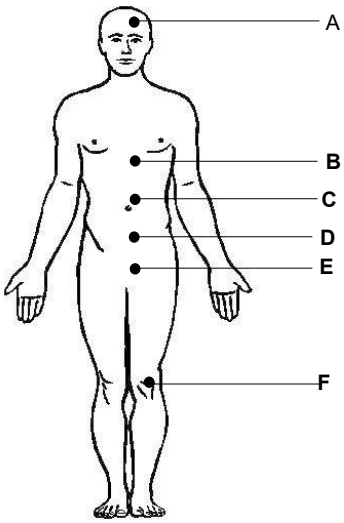
Weight composition (%):
5% Al, 20% Cu, 18% glass, 1000 ppm Au, 23% plastic, 7% steel, [1]

⚠ **A computer contains several hazardous materials such as mercury. These should be handled with care and precaution.**

Urban Mining

Copper, aluminium, steel, gold and palladium are found in computers. In the motherboard, the random access memory (RAM), central processing unit (CPU) and peripheral component interconnects (PCIs) consists of some amount of precious metals. The random access memory (RAM) is for data storage and it is a valuable part because its connectors are gold plated (Au) and coated with palladium (Pd). The hard drive composes of aluminium (Al). The heat sink is a covering on central processing unit (CPU) which is made of aluminium (Al) and its alloys. The case of a computer is made of steel and the power supply box with stainless steel. In Agbogbloshie, the printed circuit board industry is worth tens of thousands of dollars and is controlled mostly by Nigerian Migrants

Health



A. Nervous System
B. Respiratory system
C. Immune system
D. Urinary system
E. Reproductive system
F. Bone

Hazardous Material

Antimony (Sb) - Lung diseases, heart problems, diarrhoea, severe vomiting and stomach ulcer.
Barium (Ba) - Breathing difficulty, increased blood pressure, stomach irritation, muscle weakness, liver, kidney, heart damage and paralysis.
Cadmium (Cd) - Psychological disorder, cancer, liver & kidney damage. sperm damage, birth defects and headaches.

Safety Gear

The disassembly process exposes the worker to various levels of potential harm. There is a need for protective gear to reduce impact of these practises. Safety gear include gas masks to protect e-waste workers from dust and toxic gases, safety boots, hand gloves and mostly HazMat suits, which are full garments with footwear and masks, worn to protect workers from dangerous chemicals.

Tools For Disassembly

The tools required for processing: chisel, mallet, pliers,screwdriver, and wire cutters.

Chisel Mallet Pliers Screw driver

Tools are essential to the process of disassembly and are the primary means by which industrial activities are carried out. Tools have always represented societal advancement. The lack of proper tooling is a major hindrance to the industrialisation drive. In this case, knowledge of how to use them and make them represents a major cultural breakthrough.

⚠ **Tools are a potential source of injury. The risk can drastically be minimised by using the right tool for the right job. In the process of disassembling computers, are relatively low risk. Care should however be taken to avoid swallowing of really small screws.**

Step by Step Disassembly

1. Cut off all the wires and remove all connections between various components.
2. Discharge the capacitor and remove the circuit board.
3. Detach the motherboard by using screw drivers. Carefully pull off the CPU and the random access memory (RAM) from the motherboard.
4. The PCIs are also pulled off by hand since they have been soldered. This part is also valuable because it has some contents of gold.
5. For the monitor, remove the plastic housing, the back cover by removing all the screws.
6. Cut off all the cables to detach the various parts.
7. Disassemble the steering coils if any and carefully dispose off the leaded glasses.
8. Components in the computer such as the memory chips are delicate and should be handled with care, to avoid damage to them.
9. After disassembly, components should be documented. See example of this done during AMPQAMP workshop.


Mother board


Hard Disk


Memory Chips


Fan


Power Packs

Re-make

Parts of old computers can be reassembled into new components such as the Jerry (a computer made out of parts sourced from waste computer parts and assembled in a jerry-can). In addition, parts like the hard drive, can be used as stand-alone data storage devices.

There is also the possibility of making other machines such as a 3d printer, such as was done by Wafate in the Woelab in Togo (image 2). This 3d printer is the first of its kind on the African continent and in the world.

JerryCan computer, assembled from scrap computer parts from Agbogbloshie, during AMPQAMP 2014

The Wafate 3d printer made from old CPU's in the Woelab in Togo, is a brilliant example of recycling in Africa. Source: www.woelabo.com

Made in Agbogbloshie

Re-use in Agbogbloshie of a computer as a seat in a workshop

References & Notes

1. Hageluken, Improving metal returns and eco-efficiency in electronics recycling – A holistic approach for interface optimization between pre-processing and integrated metals smelting and refining, IEEE International Symposium on Electronics and the Environment, 2006, page 218–223
2. http://www.lenntech.com/periodic/periodic-chart.htm
3. http://www.epa.gov/ttn/atw/hlthef/vinylchl.html
4. ewasteguide.info

***Calculation on estimated value:**
Prices of materials vary in Agbogbloshie depending on the local market. Also the state of the materials also influences the price, that's the price of burnt copper differs from that of the unburned by 1 Ghana cedis per pound. In Agbogbloshie, copper and aluminium are weighed in pounds (lbs) and iron/steel is weighed in kilograms (kg). The prices we used in this calculation are that charged as at July, 2014.

Calculation inputs:
Total weight of equipment (W): kg
Weight percent of material (W%): %
Weight of material (Wm): W% * W
Price per material = Wm * amount in GHC per kg
(1 kg = 2.204 pounds)

** These types of EEE are mostly found and dismantled in Agbogbloshie.

For more information, visit:
http://qamp.net/computer

What is a Computer

A computer is an electronic device which accepts, stores, and processes data. Data is the raw material that comes to a computer. It turns this data into information, according to the desires and commands of the user. This exchange between user and computer, occurs via an interface. External devices that provide input and outputs for a computer are known as computer peripherals.

How it works

The monitor serves as a screen which reflects what the user inputs via a keyboard, computer mouse or other input device. Such inputs serve as commands, which are processed by the system unit linked to the motherboard. Programs can be installed on the hard disk (storage unit) and be used through the above-described process. The diagram of a personal computer and its parts is as shown below.

Material Composition

Computer

Computer Overview

Scrap Value In Agbogbloshie

A refrigerator contains several hazardous materials such as CFCs, PVC, and PUR foams in the body, as well as mercury in the light bulbs. These should be handled with care and

Urban Mining

Health

Hazardous Material

Safety Gear

Tools For Disassembly

Step by Step Disassembly

⚠

Material Composition

Computer

Computer Overview

Scrap Value In Agbogbloshie

precaution.

Urban Mining

Health

Hazardous Material

Safety Gear

Tools For Disassembly

Step by Step Disassembly

⚠