E-WASTE MAGNETIC SALVAGE

Mohamed Rafi A K, Naveen S, Prashanth

Abstract—Electronics recycling can be challenging because discarded electronic products are complex devices manufactured from varying proportions of metals, non-metals, and plastics. These materials then need to be processed and separated in to clean commodity streams that can be used make new products. Resourceful production team, systematic and secured processing allows recycling solution to provide people with closed-loop recycling services, this enable us to ensure environmentally responsible processing of our retired electronics while minimizing the risks involved with handling sensitive digital data.

Key words- E-waste, ferrous material, non-ferrous material, eddy current separator, separator.

1 INTRODUTION

Electronic waste, E-Waste, E-Scrap, or Waste Electrical and Electronic Equipment (WEEE) is a loose category of surplus, obsolete, broken, or discarded electrica or electronic devices. The processing of electronic waste in developing countries is causing serious health and pollution problems due to lack of containment, as do unprotected land filling (due to leaching) and incineration. The Basel Convention and regulation by the European Union and United States aim to reduce these problems. Reuse and recycling of these E-Waste are promoted as alternatives to disposal as trash. There was unanimity that electronic waste containing substances like lead, cadmium, mercury, polyvinyl chloride (PVC) have immense potential to cause enormous harm to human health and environment, if not disposed properly since the exact prescriptions for its disposal and safeguard were inadequate.

Thus, the imperative need for early formulation of a holistic E-Waste legislation which will eventually lead to enabling policy. It was consequently agreed that such a policy must appropriately the concerns of various stake holders, besides the views of practitioners both in the organized and unorganized sector.

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European countries have taken a systematic step towards the handling disposal and recycling of E-Waste.There are several plants established for this particular purpose where large amount of electronic waste are recycled using the best technologies. A new trend in recycling is reuse of these waste contents .Apart from these new technologies screening, reuse, granulating, refining, conditioning are also important processes in recycling. Today, the electronic waste recycling business, in all areas of the developed world has become a large and rapidly consolidating business. The electronic waste processing systems have matured in recent years, following increased regulatory, public and commercial scrutiny, and with a commensurate increase in entrepreneurial interest. Part of this evolution have involved greater diversion of electronic waste from energy-intensive down cycling processes (e.g., conventional recycling), where equipment Is reverted to a raw material form. This diversion is achieved through reuse and refurbishing.

The environmental and social benefits of reuse include diminished demand for new products and virgin raw materials (with their own environmental issues), larger quantities of pure water and electricity for associated manufacturing, less packaging per unit, availability of technology to wider swaths of society due to greater affordability of products; and diminished use of landfills. Audiovisual components, televisions, VCRs, stereo equipment, mobile phones, other handheld devices, and computer components contain valuable elements and substances suitable for reclamation, including lead, copper, and gold. Mostly employed in traditional E-Waste disposal methods, this process refers to converting all the E-Waste fractions into reusable components.

Manual dismantling signifies process of electronic items and tools being dismantled in an orderly sequence. Once dismantling is done, manual sorting of different e waste is

completed in separate categories like metals, batteries, printed wiring boards, plastics, woods, cathode ray tubes, condensers, LCDs and cables etc. These different elements are then processed through refining and conditioning steps. There is an estimate that the total obsolete computers originating from government offices business houses, industries and household is of the order of 2 million.

Manufactures and assemblers in a single calendar year, estimated to produce around 1200 tons of electronic scrap. It should be noted that obsolesce rate of personal computers (PC) is one in every two years.The consumers finds it convenient to buy a new computer rather than upgrade the old one due to the changing configuration, technology and the attractive offers of the manufacturers. Due to the lack of governmental legislations on E-Waste, standards for disposal, proper mechanism for handling these toxic hi-tech products, mostly end up in landfills or partly recycled in a unhygienic conditions and partly thrown into waste streams.

Computer waste is generated from the individual households, government, both public and private sectors, computer retailers, manufacturers, foreign embassies secondary markets of old PCB etc. Of these, the biggest source of PC scrap are foreign countries that export huge computer waste in the form of reusable components. With the extensive use of computers and electronic equipment's, people are dumping old electronic goods for new ones, the amount of E-Waste generated has been steadily increasing.

At present Bangalore alone generates about 8000 tons of computer waste annually and in the absence of proper disposal, they find their way to scrap dealers. Electronic waste or E-Waste is one of the rapidly growing environmental problems of the world.

2. GENERAL INTRODUCTION

In India, the quantity of "E-Waste" or electronic waste has now become a major problem. Disposal of E-Waste is an emerging global environmental and public health issue, as this waste has become the most rapidly growing segment of the formal municipal waste stream in the world. E-Waste or Waste Electrical and Electronic Equipment (WEEE) are loosely discarded, surplus, obsolete, broken, electrical or electronic devices. In India most of the waste electronic items are stored at households as people do not know how to discard them. This ever-increasing waste is very complex in nature and is also a rich source of metals such as gold, silver, and copper, which can be recovered and brought back into the production cycle.

So E-Waste trade and recycling alliances provide employment to many groups of people in India. Around 25,000 workers including children are involved in crude dismantling units in Delhi alone where 10,000–20,000 tons of E-Waste is handled every year by bare hands. Improper dismantling and processing of E-Waste render it perilous to human health and our ecosystem. Therefore, the need of proper E-Waste management has been realized. It is necessary to review the public health risks and strategies to combat this growing menace.

3-WORKING

3.1 Block diagram

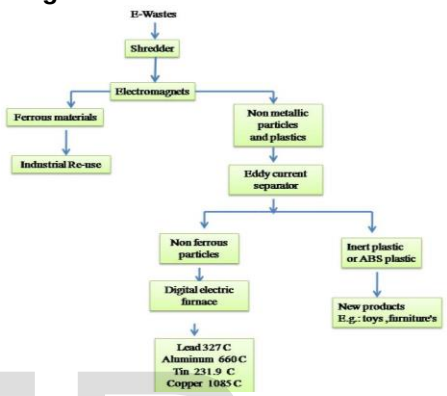

Fig 3.1 Block Diagram

Initial shredding of equipment's facilitates sorting separation of plastics and internal circuitry. As a conveyor belt transport shredded material, a powerful overhead magnet separates iron and steel from the waste stream. This separated ferrous material is collected in Gaylord and prepared for sale as recycled steel. Material is fed onto the conveyor belt of the eddy current separator, which moves it across the magnetic rotor where separation occurs. The two streams of material discharge into housing. The housing has a splitter to divide the nonferrous metal from the non-metallic material, such as paper, plastic, wood. The key component of the eddy current separator is the magnetic rotor, which has a series of permanent rare earth magnets mounted on a support plate attached to a shaft.

When a piece of nonferrous metal, such as aluminum, passes over the separator, the magnets inside the rotor rotate past the aluminum at high speed. This forms eddy currents in the aluminum which in turn create a magnetic field around the piece of aluminum. The polarity of that magnetic field is the same as the rotating magnet, causing the aluminum to be repelled away from the magnet. This repulsion makes the trajectory of the aluminum greater

than that of the non-metallic, allowing the two material streams to be separated.

Once the non ferrous materials gets separated it is passes through a electric heating furnace. The lead aluminum copper were separately collected in a gaylords through their melting point.

3.2 Initial Shredder

Circuit boards present in most electric and electronic devices are very important components, which should be removed during sorting and dismantling operations in order to allow further adequate treatment for recovering valuable metals such as copper, nickel, zinc, lead, tin and rare elements. This recovery can be made by physical and chemical processes being size reduction by shredding the first step of Initial shredding of equipment facilitates sorting separation of plastics and internal circuitry.

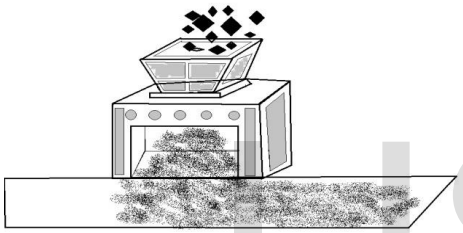

Figure 3.1: initial shredder

3.3 Powerful Overhead Magnet

As a conveyor belt transports shredded material a powerful overhead magnet separates iron and steel from the waste stream .this separated ferrous material collected in gay loads and prepared for sale as recycled steel

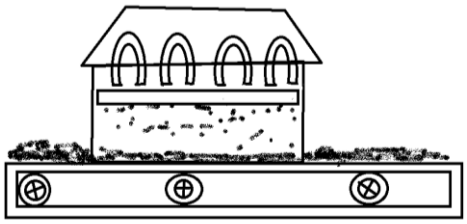

Figure 3.2: over head magnet collecting metals

As a conveyor belt transports shredded material a powerful overhead magnet separates iron and steel from the waste stream .this separated ferrous material is collected in gay loads and prepared for sale as recycled steel.

3.4 Non Ferrous Separation

Material is fed onto the conveyor belt of the eddy current separator, which moves it across the magnetic rotor where separation occurs .The two streams of material discharge into housing. The housing has a splitter to divide the nonferrous metal from the nonmetallic material, such as paper, plastic, wood. The key component of the eddy current separator is the magnetic rotor, which has a series of permanent rare earth magnets mounted on a support plate attached to a shaft.

The magnetic rotor is surrounded by (but not attached to) a wear shell which supports the conveyor belt. This allows the rotor to spin independently and at a much higher speed than the wear shell and belt. When a a piece of nonferrous metal, such as aluminum, passes over the separator the magnets inside the rotor rotate past the aluminum at high speed.

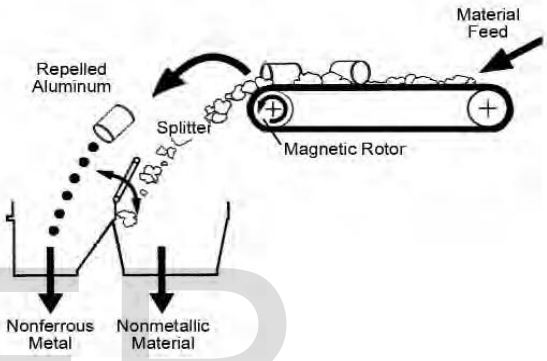

Figure 3.3: Non ferrous separation

This forms eddy currents in the aluminum which in turn create a magnetic field around the piece of aluminum. The polarity of that magnetic field is the same as the rotating magnet, causing the aluminum to be repelled away from the magnet. This repulsion makes the trajectory of the aluminum greater than that of the nonmetallic, allowing the two material streams to be separated.

3.5 Location of the Separator

Magnetic performance may be affected by magnetic material in the field. This includes such items as I-beams, metal supports, hoppers, or splitters. These and other ferrous objects need to be kept out of the magnetic zone .Place the eddy current separator at the discharge end of a conveyor or vibratory feeder. Mount the separator close enough to the feeder so that material does not fall between the two conveyors when the feeder is initially turned on or turned off. The belt surface of the separator should be below the feeder conveyor, but not so low as to cause damage to the separator belt. The greater the gap between the separator and feeder, the harder the impact will be of sharp metal pieces in the

burden falling onto the belt. Use a 45o slide chute between the end of the feed conveyor and the eddy current belt. The slide chute will present the material to the belt without impact or bouncing.

3.6 Location of the Discharge Housing

The roof and walls of the discharge housing protect you and your machinery from flying metal when the eddy current separator is running. The base of the legs of the separator and the bottom of the channel frame of the discharge housing should be at the same height. Clearance must be allowed beneath the discharge chutes for the take-away conveyors or collection bins.

3.7 Operation

Belt speed adjustment equipped with a variable frequency drive: The conveyor belt speed is preset to 400 fpm. The speed is adjustable at the drive from 198 to 440 fpm by pushing and holding one of the arrow keys on the drive until the desired speed is reached. The unit reads the speed of the belt directly in fpm. (E.g.: 400/MIN = 400 fpm).For most applications, a belt speed of approximately 400 fpm will result in the best separation .If equipped with a fixed-speed drive: The belt speed is fixed at approximately 400 fpm.

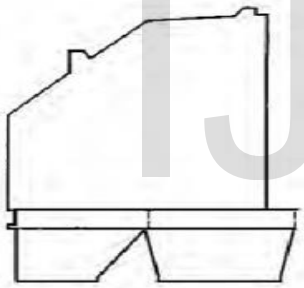

Figure 3.4 Fixed high speed drive which rotates the magnetic rotor Assembly.

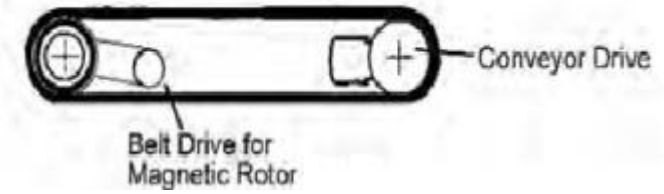

Figure 3.5 Fixed speed drive which runs the conveyor belt at about 400 fpm

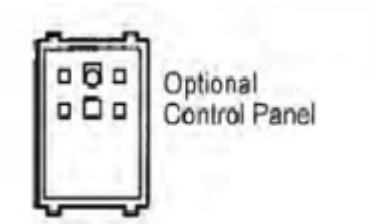

Figure 3.6 Optional motor controls are located in the control panel.

3.8. Magnetic Rotor and Drive

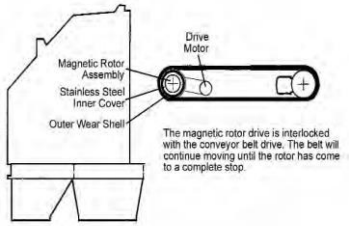

Figure 3.7 magnetic rotor and drive

Magnetic rotor assembly Contains highest grade of permanent rare earth magnetic material .Stainless steel cover Heavy-duty inner cover protects the magnetic rotor assembly from damage. Fiberglass wear shell Wear-resistant ceramic tiles are bonded to the fiberglass shell. Wear shell supports the conveyor belt. Motor Drive motor is large and very powerful to rotate the magnetic rotor at high speed. Since the motor is set at the optimum speed, it does not require adjustment. The motor shaft has a multiple belt sheave which drives the magnetic rotor pulley.

3.9 Start-Up adjustments

3.9.1 Belt Tracking and Tension

Belt tracking and tension should be checked at least every three hours for the first two days of operation. After that, check once a week.

To align the belt:

1) Adjustments are made at the take-up assembly located at the opposite end from the eddy current rotor assembly.
2) Start the belt only, with the belt at a slow speed. Be ready to shut it off if the belt walks off severely to one side.
3) Using caution around moving belt, begin tracking the belt. Use an adjustable wrench to turn the take-up in the desired direction. Make adjustments 1/4 turn at a time. To move the belt to the left, tighten the take-up on the right. To move the belt to the right, tighten the take-up on the left.

4) Do not over-tighten the belt as the eddy current has a ceramic covered fiberglass shell that could be damaged by an over-tightened belt. The belt only needs to be tight enough so that the drive pulley does not slip and the belt stays tracked. Minimum belt sag should be 2 inches. This is measured at the bottom center of the belt.

5) Once the belt is tracked, increase speed to normal operating speed and read just belt if necessary.

3.9.2 Feeding the Separator

It is very important to load the belt as uniformly and as lightly as possible. If large surges occur, nonferrous metal will be under other material. This can weigh it down and cause a decrease in its trajectory, which may result in the piece not making it over the splitter and not being recovered. In most applications, you will get the best separation at 400 fpm. If you change the belt speed after you've adjusted the splitter, you may need to move the splitter again. A vibratory feeder can be used to level out surges and provide a uniform feed to the eddy current separator. Use a 45o slide chute between the end of the feed conveyor and the eddy current belt. The slide chute will present the material to the belt without impact or bouncing. Special care must be taken when broken glass is present in the material. The slide chute should be equipped with sides that direct the material on to the belt without pushing broken glass under the belt seals. If glass gets caught under the belt seal, it may cause the belt to be cut.

4-ELECTRIC FURNACE

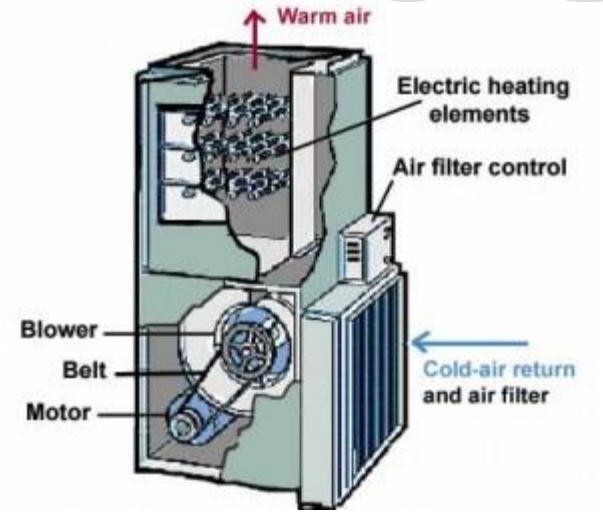

Figure 4.1: Electric Furnace

An electric furnace is similar to a conventional gas forced-air furnace except that it produces heat with electric heating elements instead of gas burners. Circuit breakers that control the heating elements may be either inside or outside the cabinet.

An electric-resistance furnace works like a big hair dryer. As with a gas forced-air furnace, it has a blower that draws air into the cabinet through a cold-air return and then pushes the air through the heat exchanger. There, electric heating elements heat the air, and the blower pushes the warmed air back into rooms through a system of duct work

Once the non ferrous materials gets separated it is passes through a electric heating furnace. The lead aluminum copper were separately collected in a gay lords through their melting point. the melting point of lead is 327 ^{o}c , aluminum 660 ^{o}c copper is 1085^{o}c.

5-CONCLUSION

On behalf of the results of the study it is state that the awareness on the subject of the risk and the management of E-waste are extremely low urgent and Electronic products should actually be considered chemical waste products .The number is increasing and their life is decreasing. Electronic waste piles are growing, as is their pollution potential. Most of these problems have their source in the development and design of the products concerned.

In E-waste management many technical solutions are available, but to be adopted in the management system, prerequisite conditions such as legislation, collection system , logistics and manpower should be prepared. This may required operational research and evaluation studies.

This kind of new innovative ideas should be introduced in our country and make our country clean and free from E-wastes.

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