Design and fabrication of hazardous electrical lighting waste separator with I.O.T (Internet Of Things/Lan) control

1.Prof.D.BabuRajendra Prasad, 2.Deepali A N, 3.Madhusudhan M, 4. P. Tejasbharadwaj, 5. Mohamedwaseempashakareem

Department of Electrical and Electronics Engineering,
Vidhyavardhaka College of Engineering, Gokulam 3rd stage Mysore, 570002, Karnataka. India

Abstract: The Lighting wastes like Fluorescent lamps contain mercury and phosphors. Even a small amount of mercury can be harmful to public health and environment. if a fluorescent lamp breaks, the mercury and other toxic chemical inside can leak out and poison our water resources. It can even enter our body through the air we breathe. Being ignorant of the proper and scientific ways of disposing, people keep them in a safe place in store room. Moreover, I had asked people under survey same question and they didn't have an answer. To be frank, people throwing fluorescent lamps to the neighbor's compound, or disposing it on the road sides and all. Hence this safety recycling concept is proposed.

Keywords: Smart E-waste management; IOT(internet of things); Eddy current separator; magnet and belt speed control ; environmental pollution crisis, separation equipment; G-Sand

INTRODUCTION

EDDY-CURRENT separation is a technique used for the recovery of conductive nonferrous particles from material mixtures and also for separating various nonferrous metals from each other. In the past years, eddy-current separators have been developed for the recovery of nonferrous metals from mixtures of waste materials. Eddy currents (also called Foucault currents) are loops of electrical current induced within conductors by a changing magnetic field in the conductor, due to Faraday's law of induction. Separated metal and glass can be used to for different by-products. Glass can be crushed and fine powder used to produce G-sand

Objectives

- Design of separator with more efficiency.
- Low cost design.
- Mercury release to environment to be controlled.
- Wireless control and monitoring through I.O.T(internet of things/ LAN)
- To recover useful materials.
- Portable

2. METHODOLOGY

The eddy current system separates nonferrous metals such as aluminum, die-cast metal, and copper from non-metallic material. 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 a housing. The housing has a splitter to divide the nonferrous metal from the non-metallic material, such as paper, plastic etc. The key component of the eddy current separator is the magnetic rotor, which has a permanent rare earth magnets mounted on a support plate attached to a shaft.

Under the combined actions of electromagnetic interactions, gravitational, and frictional forces, the particles of the feed material describe inside the separation device various trajectories, depending on their physical properties. Thus, the poorly conducting and strongly conducting particles or conductive nonferrous and nonconductive particles achieve different trajectories and leave the separation device through its inferior part on different ways, which leads finally to their separation. The disk and the separation device are inclined versus the horizontal plane with a certain angle, in order to obtain a maximum jump effect for the hopping particles.

These particles are represented by the strongly conducting particles in the case of mixtures containing strongly conducting-poorly conducting particles and conductive nonferrous particles in the case of mixtures containing conductive nonferrous-nonconductive particles, respectively. Another reason for the inclination is to facilitate the movement of the particles down the separation device under the combined action of the tangential component of the gravitational force and the frictional force.

EddyCurrent Separator Specification,

JECS-20, 4 TONS/HR, 20”-Belt width, 1.5 H.P-Drive 3 H.P-Motor HP

JECS-30, 6 TONS/HR, 30”-Belt width, 2.0 H.P-Drive 5 H.P-Motor HP

JECS-40, 8 TONS/HR, 40”-Belt width, 3.0 H.P-Drive 7.5 H.P-Motor HP.

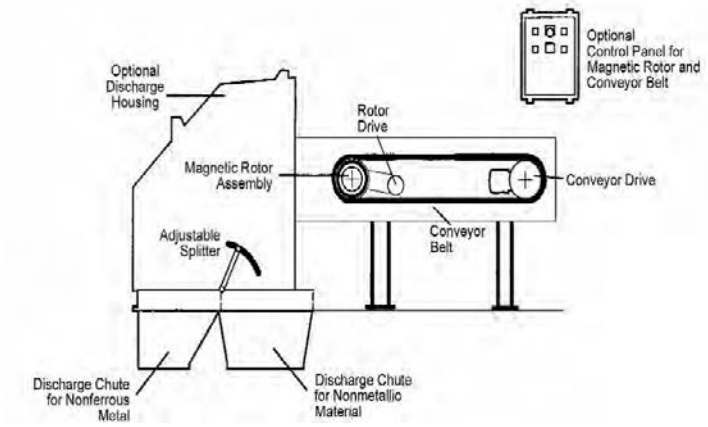


Fig1:Proposedmodel

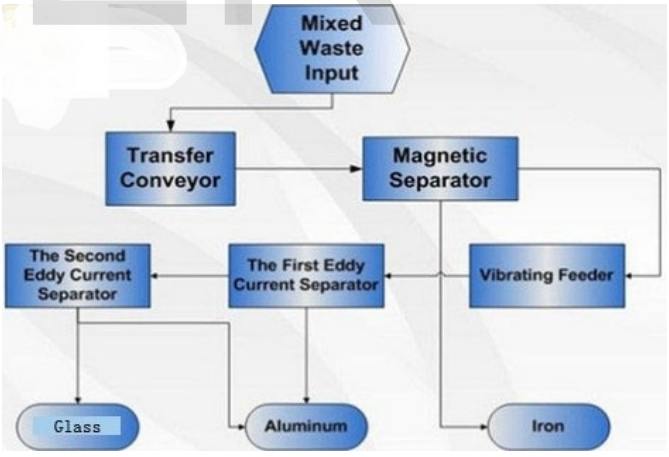
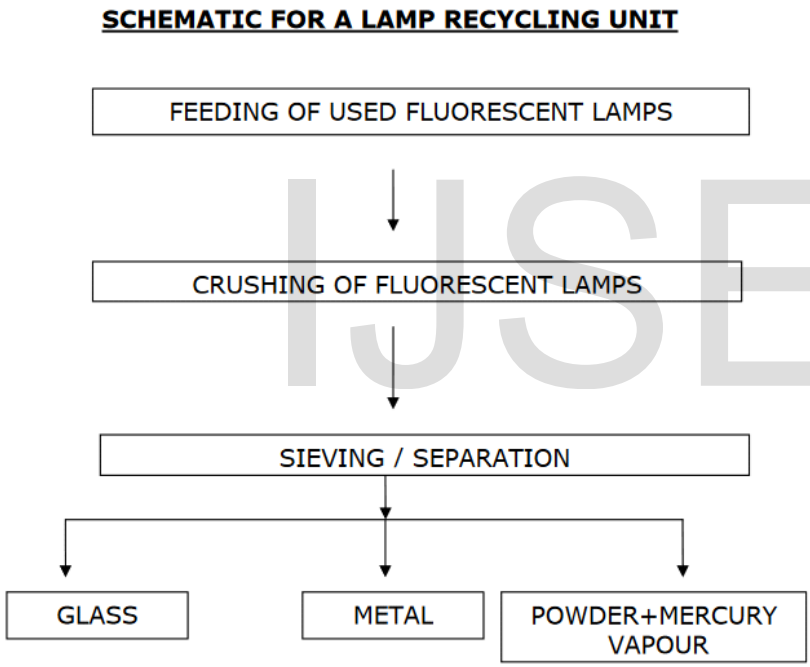


Fig 2: Flow diagram

WORKING PRINCIPLE

The collected lighting waste feed to the crusher machine which gives the glass powder, aluminum, plastic, ferrous materials separated by the mechanical filter connected to vibrator, the aluminum is lifted by the eddy current principle, plastic is throughout because of the speed adjustment of the motor to a separate bin, and ferrous materials are separated by the magnetic disc provided. This machine works with pollution free fitness, and controlled by the IOT equipment's and programs. The fine glass powder is sent through the liquid to extract the mercury and phosphorus planned to be processed with plastic waste to produce the glastic or in powder state as G-Sand, which will be used to produce the Glastic to manufacture the Disc insulator



IOT

IOT or internet of things used to control, monitor electronic and mechanical devices, and other physical devices connected to the internet. IOT control through a comfortable GUI over the internet. This system uses an AVR family microcontroller for processing all user commands. A wifi modem is used to connect to the internet and receive user commands. On sending commands through the internet , first received by WIFI modem. The modem decodes information and passes it to the microcontroller for further processing. The microcontroller then switches loads and operates the motors as per receiver's commands.

OUTCOMES

- Highly efficient separation of ferrous and nonferrous materials from the waste disposal.
- Providing environmental proof separation and collection of materials
- Low cost separation is reached.
- More efficient controlling and monitoring of eddy current separator.

APPLICATIONS

1. 98% recovery of aluminum cans from commingled recyclables.
2. Aluminum is used for bottle caps in injection moldings.
3. Non-ferrous metal recovery in refuse streams and ash streams in Waste-to-Energy facilities.
4. Separation of non-ferrous chips and Glass cullet for road sign paints.
5. Aluminum scraps recovery in foundry sand reclamation.

CONCLUSION:The proposed concept is to solve the socio technical problem, which is a health threat to the public This may reduce the environmental pollution by some percentage. The project develops the separation technology for the hazardous lighting waste. The IOT control is provided to vary the speed of the driver and the motors. And this may be the solution for the electrical waste recycle by producing the Glasticwhich may be used to produce the electrical insulation films which is more thermal resistant or the Disc Insulators.

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