Waste Management of Construction and Demolition

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Abstract : Construction industry has been developing rapidly around the world. The development has led to serious problem in generation of construction wastes in many developing countries and expectation of the natural resources to large extend. The construction wastes clustered into physical and non-physical waste and it has greater impact to environment, economy and social of each country.

Before it can be managed well, it is important to understand the root cause of the generation. This paper identifies and detects factors contributed to the generation of construction waste. Mapping technique was applied for identification works and interview was conducted to detect the physical and non-physical waste.

These factors were grouped into seven categories: Design, Handling, Worker, Management, Site condition, Procurement and External factor. The significant factors of each category of waste were determined. The findings will help construction players to avoid, reduce and recycling the physical and non-physical wastes. Furthermore, the paper has put forward some recommendations for better improvements in construction

***IndexTerms* - Construction waste, Material wastage, Waste management, Vietnam, Barriers,Waste minimization, Waste**

Introduction

There are two major problematic areas in waste management - collection and disposal.

Issues in managing these arise due to unregularized and slow processes, inefficient tracking mechanisms, communication barriers, not having enough resources and scattered settlements.

Whether it's a liquid and a solid waste produced by the food industry or construction sites or urbanization, well-equipped ERP systems offer solutions to all the challenges that impacting waste management.

Major Benefits of Waste Management ERP System

Benefits of advanced ERP software are boundless. Essentially, its tools are employed for effective planning and management of different aspects of your business and help it become as competitive as possible.

Improve Information Management

Waste management involves documenting information for different collection and dumping sites. This gathered data ought to be stored securely for future undertakings.

A smart waste management system helps in this. It stores data on the cloud and additionally allows you to continuously add or modify the information as and when needed, without distorting the existing ones.

Enable Safer Disposals

Safety disposal of waste is always of top concern in maintaining cleanliness and sustainability drive for health and resource conservation.

ERP system eases the process. The system allows you to oversee the work done at every level and ensures that these processes function in compliance with the safety standards set for waste management and recycling programs.

Better Task Scheduling

Your waste management company might require dealing with multiple projects, simultaneously. Keeping track of their progress is tricky.

A modular ERP system offers clear and easy-to-follow dashboards, helping you remain constantly updated about every change. The software also allows you to implement instructions in an accessible way, letting your staff have a clear idea about their individual tasks.

Effective Resource Allocation

An integrated ERP system ensures that your employees are working on the right tasks at the right time, especially when they work on bigger waste management projects that incorporate multiple locations.

Managers can directly delegate tasks to the team members using the system while the employees are provided access to check what they require doing. This is an easier way to make your workforce perform tasks in accordance with the priorities and effectively save time.

Ultrasonic proximity sensors

Wood, Glass, And Plastic separation

Ultrasonic proximity sensors are used in many automated production processes. They employ sound waves to detect objects, so colour and transparency do not affect them (though extreme textures might).

This makes them ideal for a variety of applications, including the long range detection of clear glass and plastic, distance measurement, continuous fluid and granulate level control, and paper, sheet metal, and wood stacking.

The most common configurations are the same as in photoelectric sensing: through beam, retro-reflective, and diffuse versions.

Ultrasonic diffuse proximity sensors employ a sonic transducer, which emits a series of sonic pulses, then listens for their return from the reflecting target.

Once the reflected signal is received, the sensor signals an output to a control device.
Sensing ranges extend to 2.5 m. Sensitivity, defined as the time window for listen cycles versus send or chirp cycles, may be adjusted via a teach-in button or potentiometer.
While standard diffuse ultrasonic sensors give a simple present/absent output, some produce analogy signals, indicating distance with a 4 to 20 mA or 0 to 10 Vdc variable output.
This output can easily be converted into useable distance information.
Ultrasonic retro-reflective sensors also detect objects within a specified sensing distance, but by measuring propagation time.
The sensor emits a series of sonic pulses that bounce off fixed, opposing reflectors (any flat hard surface — a piece of machinery, a board).
The sound waves must return to the sensor within a user-adjusted time interval; if they do not, it is assumed an object is obstructing the sensing path and the sensor signals an output accordingly.
Because the sensor listens for changes in propagation time as opposed to mere returned signals, it is ideal for the detection of sound-absorbent and deflecting materials such as cotton, foam, cloth, and foam rubber.
Like through-beam photoelectric sensors, ultrasonic through beam sensors have the emitter and receiver in separate housings.
When an object disrupts the sonic beam, the receiver triggers an output.
These sensors are ideal for applications that require the detection of a continuous object, such as a web of clear plastic.
If the clear plastic breaks, the output of the sensor will trigger the attached PLC or load.

Ultrasonic sensors

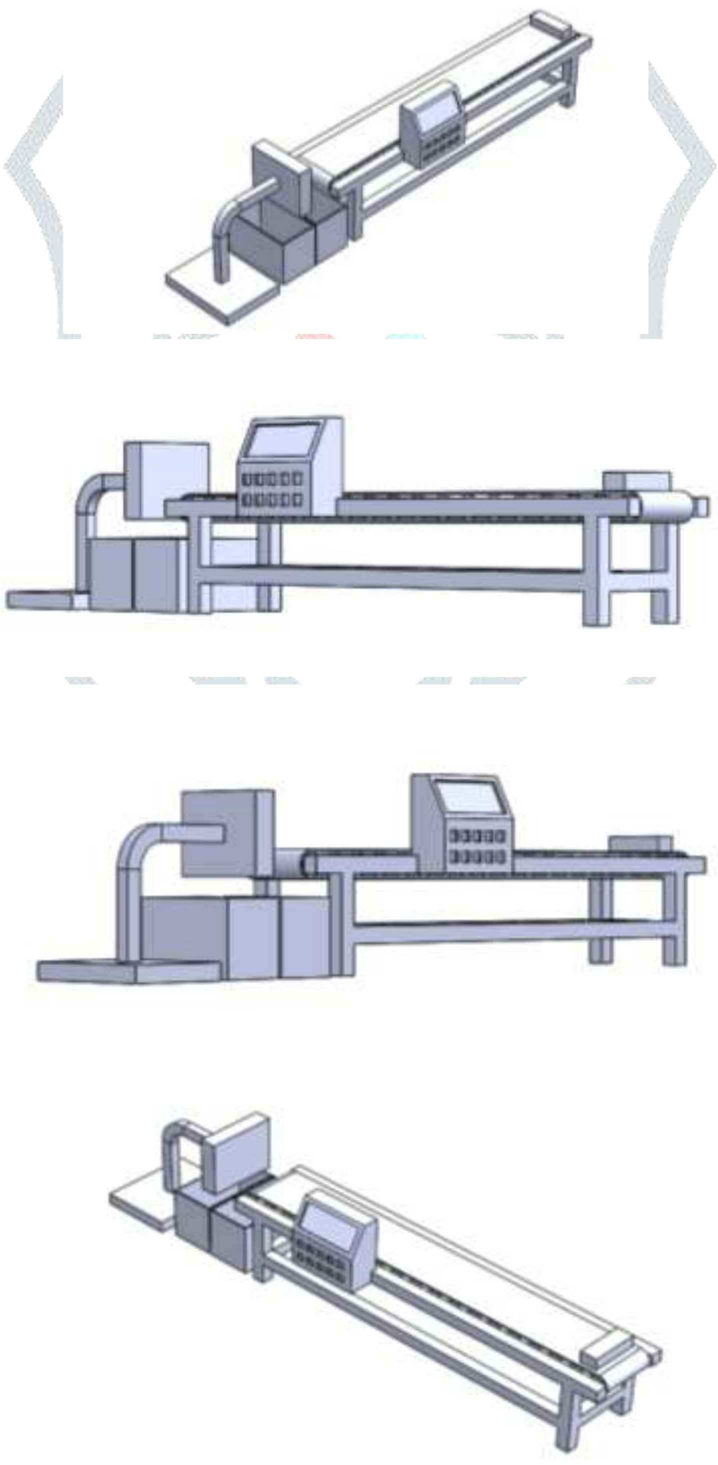

Figure 14: Ultrasonic sensors

Separation Technologies

Magnetic Separation

Magnetic separation is used when a large quantity of ferrous scrap must be separated from other materials. Permanent magnets and electromagnets are used in this process.

The latter can be turned on and off to pick-up and drop items. Magnetic separation can be of either the belt-type or the drum-type. In the drum, a permanent magnet is located inside a rotating shell. Material passes under the drum on a belt.

A belt separator is similar except that the magnet is located between pulleys around which a continuous belt travel.

Eddy Current Separation

Eddy current separators are used to separate non-ferrous metals from waste and ASR. The process generally follows the primary magnetic separation process, and it exploits the electrical conductivity of non-magnetic metals.

This is achieved by passing a magnetic current through the feed stream and using repulsive forces interacting between the magnetic field and the eddy currents in the metals.

The simplest application of the process is the inclined ramp separator.

This uses a series of magnets on a sloped plate covered with a non-magnetic sliding surface such as stainless steel.

When a feed of mixed materials is fed down the ramp, non-metallic items slide straight down, while metals are deflected sideways by the interaction of the magnetic field with the induced eddy current.

The two streams are then collected separately. Variations of the eddy current separator include the rotating disc separator, in which magnets are arranged around a rotating axis.

Yet another system uses a conveyor with a head pulley fitted with magnets.

Both systems rely on the varying trajectories of materials either affected or unaffected by magnetic fields, to make the separation.

Colour, Density, Magnetic, Spark, Chemical and Spectroscopic

Scrap materials are typically identified by skilled sorters using a limited number of physical and chemical tests. These tests rely on object recognition, colour, apparent density, magnetic.

properties, nature of spark pattern when ground on an abrasive wheel, chemical reaction to reagents, chemical analysis, and spectrographic analysis.

Physical properties such as colour, density and relative hardness can be used to quickly separate.

certain classes of materials.

For example, copper and brass can be identified by colour, while lead can be recognized by both its density and relative softness. Differentiating between alloys of similar grades and compositions can be more difficult, in these cases, magnetic testing, spark. testing, and chemical and spectroscopic analysis can be used.

Magnetic testing can also be used as iron, nickel and cobalt are ferromagnetic, as are low-alloy stainless steels.

Therefore, while magnetic testing cannot be used to differentiate between alloys, it can classify alloys into their series. Spark testing involves grinding an alloy on an abrasive wheel.

The colour and length of the spark can be used to identify the alloy. There is a spectrometer that analyses the spectra given off from the spark and compares it with standards to identify the alloy, but this unit is not truly portable and is therefore not widely used.

Various optical and X-ray spectrometers can be used to identify the composition of alloys. Thermoelectric testing involves using the See beck effect to identify materials.

These thermoelectric devices contain two probes made of the same metal, one heated and one at ambient temperature.

When they contact the scrap, a potential difference is generated that is characteristic of the metal being tested.

Chemical spot tests are also used whereby reagents such as acids are dropped on the metal and the reaction is observed.

Colour Sorting

Colour sorting is one of the first automated sorting processes to be used industrially, and it was developed by the Huron Valley Steel Corporation (HVSC), which is the world's largest nonferrous scrap sorter.

Over the last decade HVSC has used this technique to sort zinc, copper, brass and stainless steel. Colour sorting is based on computer image analysis, where the colour of each metallic piece is detected.

Pieces whose colour lies within a specified range are automatically directed out of the feed material. For this to work properly, a singling mechanism is used to produce a chain-like profile of scrap particles before the image detector.

HVSC's colour sorter has proven to be exactly accurate, producing metal purities over 98%. This purity is possible because this sorting method is independent of particle size and shape.

The technological advancement of computers over the last decade has greatly increased the speed of real-time image analysis.

Due to the advancement of industrial colour sorters over the last few years, the ability to effectively sort different metals with slight colour variations has improved dramatically.

Laser-Induced Breakdown Spectroscopy

Laser-induced breakdown spectroscopy (LIBS) is a scrap sorting system that determines the actual chemical composition of each piece of scrap in a fast and economical manner to achieve the highest quality scrap possible.

LIBS technology was first developed by the Los Alamos National Laboratory in the early 1980s for a wide variety of applications. However, it was not until the early 1990s that this technique was implemented for the analysis of solid metal pieces in a joint project with Metal Gesell shaft.

The results of this project showed the practicality of this technique to accurately determine the elemental composition of metallic scrap.

However, the focus of their project was on the identification of the matrix element and not on the complete spectral analysis of all elements in the scrap.

While it has many advantages, LIBS do have its limitations. The biggest drawback is that the surface of the scrap must be free of paints, lubricants, or adhesives, since the pulse laser can only penetrate a depth of thirty angstroms or less on the surface of the metal.

X-rays can also be used instead of a laser to illuminate the surface of the scrap. X-ray fluorescence (XRF) has been used for alloy identification, and several commercial devices, both portable and handheld, are already available.

CONCLUSION

From the above study concludes that for the proper utilization of construction and demolition waste, legislation must specifically address C&D waste management. Additionally, the communication level and availableness of technology for C&D waste re-use and recycling must be improved to form a sustainable amendment in India.

Quality standards for the recycled or re-used products got to be developed and monitored by Bureau of Indian Standards. In Indian scenario it required that the information of the construction waste and the quality of the C&D waste is to be available online.

Public or private sector should be formed for the C&D waste information collection and the processing.

There must to be a correct institutional mechanism to require care of the gathering, transportation, intermediate storage, exercise and disposal of C&D wastes.

Separation of C&D waste should to be promoted at supply and particular enterprise will be gainfully utilized for the gathering and transportation of the waste.

Public-Private-Partnership (PPP) schemes could also be attainable mechanism of implementation of C&D waste management in Republic of India

REFERENCES

[1]. https://nrcne.org/wp-content/uploads/2019/12/cdra_benefits_of_cd_recycling_final_revised_2017.pdf
[2]. https://www.mekaglobal.com/en/blog/construction-and-demolition-waste-recycling-meka
[3]. https://www.epa.gov/smm/sustainable-management-construction-and-demolition-materials
[4]. https://www.devalt.org/images/L3_ProjectPdfs/AhmedabadreportonC_Dwastemanagement.pdf
[5]. https://www.eu-rei.com/pdf/publication/NA_MoHUA_Strategy%20on%20RE%20in%20C&D%20Sector_Jan%202019.
[6]. https://www.irbnet.de/daten/iconda/CIB14286.pdf
[7]. https://www.emerald.com/insight/content/doi/10.1108/02632771111120538/full/html?skipTracking=true
[8]. https://www.emerald.com/insight/content/doi/10.1108/IJBPA-04-2020-0029/full/html?skipTracking=true
[9]. https://www.emerald.com/insight/content/doi/10.1108/ECAM-11-2018-0492/full/html?skipTracking=true
[10]. https://www.emerald.com/insight/content/doi/10.1108/09699981111145835/full/html?skipTracking=true
[11]. https://www.emerald.com/insight/content/doi/10.1108/ECAM-12-2019-0683/full/html?skipTracking=true
[12]. https://www.emerald.com/insight/content/doi/10.1108/BEPAM-01-2020-0012/full/html?skipTracking=true
[13]. https://www.emerald.com/insight/content/doi/10.1108/JFM-10-2016-0041/full/html?skipTracking=true
[14]. https://www.emerald.com/insight/content/doi/10.1108/MEQ-09-2014-0137/full/html?skipTracking=true
[15]. https://www.emerald.com/insight/content/doi/10.1108/JEDT-03-2019-0064/full/html?skipTracking=true
[16]. https://www.emerald.com/insight/content/doi/10.1108/BEPAM-08-2012-0045/full/html?skipTracking=true
[17]. https://www.emerald.com/insight/content/doi/10.1108/ECAM-11-2019-0632/full/html?skipTracking=true
[18]. https://www.emerald.com/insight/content/doi/10.1108/CI-Nov-2011-0054/full/html?skipTracking=true