A LOW-COST SOLUTION TOWARDS RECYCLE UNIT MANAGEMENT

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A novel approach towards recycles units' management targeted for low-cost outcomes is proposed in this work. A single bit passive battery free radio frequency (RFID) tag is designed and deployed for recognition of plastic materials in waste management units. The tag holds compact dimensions of 10mm radius, resonating at 5.6GHz frequency. The tag can be utilized for identification as well as for plastic and non-plastic type detection at huge recycle chambers. Environment friendly, biodegradable tag finds best suitable applications in IoT (internet of things) based smart wireless identification and tracking systems.

Today in Australia, only 25% people justify proper waste management every time they throw the garbage [1]. Not only lack of appropriate knowledge causes hindrance in proper trash separation, but also confusion to utilize varying bins also makes the efforts useless and make a compromise on better intentions. To combat this vital issue in era of smart world, a low-cost non-hazardous and non-line of sight identification system is proposed. Smart cities with smarter houses can reduce and manage waste and energy [2]. The approach is to deploy an environment friendly tag on every plastic (type-1-7), glass and metal materials at their manufacture time/ or labelled afterwords. The low-cost tag is easy to be deployed over numerous entities. Once the tag response is captured and saved at server, any deviation from stored data bits is captured as 'non-plastic type' waste recognition at reader. Ultimately the waste is separated automatically at huge recycle units. The tag resonates at 5.6GHz frequency 'f_r', but its response for plastic tagged material is saved at a shifted frequency 'f_s'. So, the reader will map the response for every tagged item at recycle management units, and easily monitor and manage the waste. This process can be done simultaneously with non-line of sight communication, where the proposed technology leads ahead compared form previously available optical/light/active tags for recycling.

The tag is designed, and its response is captured for plastic and non-plastic type materials. The proposed research approach and its flow for recycle and non-recycle waste management is shown in fig. 1 [3]. In future, the work needs extension towards vast scale deployment at industrial level for internet of things (IIoT).
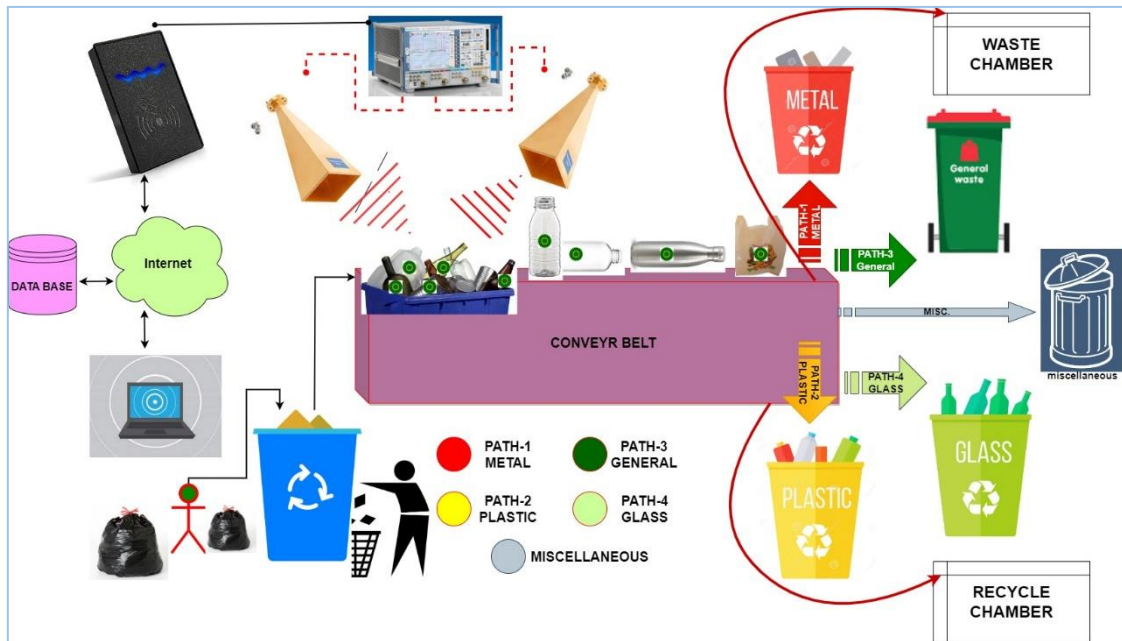

Fig. 1: Proposed Approach Flow.

[1]   Geca, "*Discover How To Combat Wishcycling For Better Recycling Outcomes*," GECA News and Events, https://geca.eco/news-and-events/discover-how-to-combat-wishcycling-for-better-recycling outcomes/, 15/10/2023.

[2]   "*Reducing Waste at Home*," City of Sydney, https://www.cityofsydney.nsw.gov.au/environmental-action/reducing-waste-at-home, 21/10/2023.

[3]   H. Anam, S. M. Abbas, I. Collings, and S. Mukhopadhyay, "*Material Classification and Accuracy Testing Using Passive CRFID Transponder in Recycle Unit*," 16th International Conference on Sensing Technologies (ICST) 2023.