**CHAPTER 3**

**EXISTING METHODOLOGY**

Technology always help mankind in making life easier. Now presenting an innovative way which revolutionize the trash management system through this we are taking a step towards clean India. Present scenario in the public places where proper disposal is not being done because of which we come across overflow dustbins. Even the private areas which are clean enough failed to utilize the resources efficiently.

To properly manage the waste it has to be handled, segregated, transported and disposed so as to reduce the risks to the public lives and sustainable environmental. There is a rapid increase in capacity and categories of solid waste as a result of urbanization, constant economic growth, and industrialization. Global Waste Management Market reported that the amount of waste generated worldwide produced is 2.02 billion tones. This method is easy and simple solution of segregation of three types of wastes dry, metal and wet.

It is designed to sort the trash into metallic waste, wet waste and dry waste ready to be processed separately for the next process of operation for this. Using Embedded technology to continuous monitoring the dustbin in order to check whether dustbin is full or not. Wireless sensors sense the amount of waste in the containers if it reached the maximum container capacity, sends instant messages to the trash management department which deploy them to collect the garbage in no time. By implementing this product at different location, instead of driving blindly on the static routes, we can optimize the collection schedule.

The Sensor Based Smart Dustbin (SBSD) effectively employs moisture sensors to segregate. Our proposed work aims at segregation of waste materials in particular metal, wet and dry waste. It is the first step towards recycling. Recycling the waste materials has a huge impact on the economic condition of the country since recycling of plastic can reduce the manufacture of plastic using renewable resources and it also has an immense effect on the environment by effectively managing the solid waste. However, many up gradations can be done to our existing project. Some of which are listed below.

* Advanced processing techniques can be incorporated once the waste has been segregated.
* Methods for individual material feeding for local use so that the segregation can be per-formed continuously once the waste is dumped.
* Image sensing can be used to segregate materials through Image processing technology.

Waste disposal companies dealing with the sorting of materials will commonly use one or more of these five methods:

1. Trommel separators/drum screens

These separate materials according to their particle size. Waste is fed into a large rotating drum which is perforated with holes of a certain size. Materials smaller than the diameter of the holes will be able to drop through, but larger particles will remain in the drum.

2. Eddy current separator

This method is specifically for the separation of metals. An ‘eddy current’ occurs when a conductor is exposed to a changing magnetic field. Put simply, it is an electromagnetic way of dividing ferrous and non-ferrous metals.

3. Induction sorting

Material is sent along a conveyor belt with a series of sensors underneath. These sensors locate different types of metal which are then separated by a system of fast air jets which are linked to the sensors.

4. Near infrared sensors (NIR)

When materials are illuminated they mostly reflect light in the near infrared wavelength spectrum. The NIR sensor can distinguish between different materials based on the way they reflect light.

5. X-ray technology

X-rays can be used to distinguish between different types of waste based on their density.

**3.1 MANUAL SORTING**

It should also be mentioned that manual sorting of waste is still very much a technique that is used in the world today. Danish company M&J says many of its shredders are bought by companies that want to use them prior to material being sorted by hand on so-called manual picking lines. M&J has shredders that can produce large-sized particles, making it easier for those hand-sorting the waste to do their jobs effectively.

Those companies paving the way in the sorting of waste use the aforementioned technologies, but are also constantly developing new and more effective methods. In sorting there is a multitude of ways to get the job done. This article aims to provide a flavour of the most common, as well as the most innovative, methods of sorting being used by European waste disposal companies today. We do not have the space to go into detail on every method currently available and in use, but hope this article serves to give an overall impression of the technologies employed in today’s market and their value to society.

**3.2 MOBILE SORTING**

With today’s recycling culture, sorting is surely set to increase. Not all companies can transport the waste to their own plants in order to separate it sometimes this work needs to be done on site. Mobile sorting machines are therefore a must, and one company that is leading the way in this field in waste screening is Doppstadt with its SM series of mobile sorters. The SM series uses drum screens and is adaptable to a variety of uses.

There are four different machines to choose from depending on the type and size of waste to be sorted, and each of them includes features designed to make them easy to maintain, keep clean and transport. The rotating drums have rotating brushes to keep them from getting clogged up and are capable of dealing with heavy materials. They employ a patented load-sensing technology which optimizes the flow of material through the drum and the machines benefit from short set-up times as they have hydraulically-folding discharge conveyors.

The SM series can sort anything from compost to construction waste and soil to materials excavated from landfill. Just one example of a use for mobile sorting technology is a plant set up by Cesaro Mac Import in Italy using Doppstadt machinery. As well as a shredding machine this plant makes use of a screening station, SST 1025, with a 40 mm trommel screen. The plant processes waste that is the by-product of paper recycling. This waste comprises paper rejects and sludges. These rejects or foreign fibres can be processed once they are separated and their calorific value is useful so it is important to use effective technology that can remove this matter from the sludge. The Doppstadt screens in Italy process 550 tonnes of rejects each day.

**3.3 ENHANCED RESOLUTION**

One of the key features of companies leading the way in today’s market is the ability to sort the increasingly diverse range of materials coming through, and deal with them appropriately. Titech, a global company with its headquarters in Norway, has long been aware of this issue and has been spearheading technologies which have now been adopted across the industry. The 15-year-old company sorts a huge range of materials; everything from plastic bottles and WEEE to construction and industrial waste.

It places a great deal of importance on research and development. It knows that new materials will be created, but the need to dispose of them correctly will also be paramount. In light of this it uses a diverse range of sensor technology in order to get the purest fractions from every waste stream. The sensor technologies applied at Titech include: NIR (near infrared), which recognizes different materials based on their spectral properties of reflected light; CMYK (cyan, magenta, yellow, key) sorts paper or carton that has been printed using CMYK; VIS (visual spectrometry) recognizes all colours that are visible and works for both transparent and opaque objects; EM (electromagnetic) sorts metals with electromagnetic properties, as well as sorting metals from non-metals and recovers stainless steel or metallic compounds; RGB sorts specifically in the colour spectrums of red, green and blue for specialized applications and X-ray sorts by recognizing the atomic density of materials. This enables Titech to achieve a high purity level regardless of size, moisture or pollution level.

Another emerging technology is MIR (mid infrared) which works on a similar principle to NIR, but projects light in the mid infrared range onto materials to be analysed. French company Pellenc ST has been piloting this technology in 2008 as a more efficient way to separate paper and cardboard. Traditionally machines have employed the same technology used to sort plastics, i.e. colour sorting methods, to sort paper and cardboard but this results in a much lower level of efficiency. Pellenc ST says its new MIR method brings efficiency levels up to 90% which is an improvement of around 30%.

The range of sensors used at Titech gives us a good indication of the direction the European, and indeed global, sorting market is taking. The company’s flagship machines at the moment are the Titech Finder, which can take a high throughput of material and achieve excellent purity, and the Titech Polysort Flake, which can sort smaller particles at extremely high resolution. As many readers will know, Titech has recently expanded its operations by forming a partnership with leading German company CommoDas, which has further increased the range of materials that it is capable of sorting.

German company RTT has been operating since 1990 and is famous for its trademarked Unisort machines which have been tailored to specific waste streams. The Unisort CB, for example, salvages circuit boards from WEEE, while the Unisort P can sort a wide range of polymers, papers and more using NIR.

The company has always been ahead of the game and its response to the demand for high resolution has been another of its successes. The Unisort Flake deals with waste at a fraction size of 350 mm and can be programmed with specific criteria for every waste stream. As with most sensor sorting machines, the waste is fed in on a conveyor belt under the sensors which then instruct the high-pressure air jets to separate the waste into the appropriate containers.

**3.4 COMPACT SORTING**

So, with the high level of variation in waste streams it usually takes a combination of technologies to separate it all successfully and the stream may also need more than one run through the filtering machine. But these days, customers are increasingly demanding. They want a machine that can separate as much waste as quickly as possible and, with the size of machines also a factor, they are looking for something that takes up the least amount of space.

Enter S+S Separation and Sorting technology GmbH and its Varisort Compact system, which had its grand unveiling at the 2008 IFAT show. This Bavarian company focuses on the detection and separation of contaminants from material streams, and has worked hard to produce a machine that industry professionals would see as a good investment. S+S obviously knows its market. The Varisort machine combines inductive, optical and NIR sensors which can run simultaneously, and its accuracy of detection is impressive sorting up to 500,000 parts per second. It also includes high-speed valves which can process up to 500 switching cycles per second.

Its modest size means it appeals to those companies for whom space is a factor. And it is also impressive to note that its lack of stature has in no way compromised its ability to separate waste. S+S has simply made its shorter conveyor belt faster and the compressed air blasts even more precise in order to make sure the job is done properly.

Peter Mayer, Sorting Sales Manager at S+S says ‘Because of its outstanding flexibility the Varisort Compact system is ideal for sorting electronic waste. Irrespective of the type of electronic waste that needs to be sorted, the Varisort Compact can always optimally perform the sorting task by employing different sensors.’

For companies that deal with large-scale waste such as WEEE, a compact sorting machine like this can be a godsend. With any recycling technology one must consider that it is only ever one part of a larger processing system, which usually comprises several machines and takes up a large amount of space.

**3.5 ONE COG IN A LARGER WHEEL**

Sorting is, of course, just a single element of the waste disposal/recovery process. But it is a vital part and can come at almost any stage in the life of the waste stream once the material has been discarded. With this in mind the big players in the sorting market have to remain flexible and provide technology that can cope with literally any type of waste.

Obviously, technology which is designed to deal with small scale flakes cannot also cope with large scale WEEE or wet agricultural waste, but companies are trying to get as close as they can to developing machines that are multi-purpose and combine technologies to do several different jobs at once. Toratec’s EcoTowerSort® is designed for separating metal fractions, but sorts its waste stream in several different stages using different types of technology.

This means it is able to combine different waste processing methods which would have previously required more than one machine. Its combinations of eddy currents, inductive metal sensors, optical camera sensors and NIR enable it to give the purest resulting waste streams possible. Customers looking to buy an EcoTowerSort are able to specify the waste streams they usually deal with and purchase a machine with the exact combination of technologies they need.

**3.6 FROM EUROPE TO CHINA**

German company EuRec Technology GmbH is particularly noteworthy as a company which is versatile in its handling of waste. As part of its offering a complete line of processing technologies, EuRec favours inclusion of a disc separator to provide solutions for a number of mixed waste streams. The disc separators can screen crushed waste, compost and brown coal, process reclaimed material from landfill, process waste incineration ash and separate inert materials from incineration plants as well as sewage sludge and other cohesive materials. The ability to deal with both wet and dry materials makes this technology ideal for taking on large-scale mixed waste disposal operations.

One such project EuRec has recently embarked upon is a waste treatment plant in China. The plant deals with municipal solid waste from a district of Beijing. The multi-component domestic waste goes through the mechanical treatment process and is then separated into useful materials. This may be a relatively new approach in China, but is commonplace at established mechanical-biological treatment plants in Germany and Europe.

The limits on the amount of organic or biodegradable waste imposed by the European Landfill Directive means that technology such as EuRec’s disc separators have even more value in today’s marketplace. Technology that can cope with organic and solid waste together enables waste disposal companies to fulfil these requirements in an efficient and cost-effective way.

**3.7 GLOBAL MARKET**

Eurec’s move to China shows that the demand for effective and efficient sorting is becoming increasingly global. And another German company which has now spread its reach into Asia is sorting giant Steinert GmbH which specializes in the separation of metals.

At the company’s global sales conference in April 2008 it signed contracts with its Japanese partners in order to establish Steinert Japan, a joint venture for which Steinert GmbH has the majority share. Discussions at the conference also covered the various global marketing methods for recycling and recovery (and therefore sorting) of waste. Each area of the world approaches its waste differently and therefore Steinert GmbH will be applying different strategies in its worldwide marketing. The company felt that its global sales meeting provided a great platform to discuss these different opportunities and optimize the benefits it is able to provide to its customers.

On a global scale the opportunities for waste handling companies are increasing alongside increased global awareness of environmental issues, and recovery is set to become all the more important in areas such as minerals processing, electronic scrap, metal recycling, refuse and the food industry.