Technical School No. 11 OF 6 "Manuel Belgrano"

Project A.S.D.O

"Intelligent Commitment to environmental care"

Technical Report

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Introduction

The idea comes from the concern to carry out a project that is in a certain way a tool against existing pollution, that is, to form a tool that allows us to recycle in a more optimal way.

It is public knowledge that the level of pollution in the world increases over time and is a big problem in the most urbanized areas, leading to the search for new technologies that allow us to carry out better recycling processes.

This problem prompted us to think about how this task can be facilitated in a massive recycling process.

By virtue of pre-existing models and the recent boom in this technology in full development, due to the security, speed and efficiency offered by automating certain processes through Artificial Intelligence plus the knowledge that the participating students have, we conclude that we can carry out this experience.
Ultimately, our goal is that this recycling process can be automated through the use of Convolutional Artificial Intelligence.

Recycling center information:

How does the recycling process work?

Waste enters the materials recovery facility when collection trucks dump it onto the discharge floor. The materials are then picked up and placed on conveyor belts, which transport them to the pre-sorting area. Here, human workers remove some items that are not recyclable, which will be sent to a landfill or incinerator. Potential hazards such as lithium batteries and aerosol cans, which can cause fires, are eliminated, as are materials such as plastic bags and hoses, which can entangle recycling equipment. From there, the materials are transported via another conveyor belt to the disc screen, which separates wide, flat materials, such as flattened cardboard boxes, from items such as cans, jars, paper and bottles. The flattened boxes travel across the disc screen to the other side, while all other materials fall below, where the paper is separated from the waste stream with a blower. The flow of cardboard and paper is monitored by more human workers, who make sure there is no plastic, metal or glass. Newer or adapted MRFs may use industrial robots instead of humans for presorting and quality control. The metal is separated from the plastics and glass first with electromagnets, which remove the ferrous metals. Non-ferrous metals such as aluminum are then removed with eddy current separators.

The glass and plastic streams are separated by other disc screens. The glass is crushed into glass cullet for easy transportation. The plastics are then separated by polymer type, often using infrared technology (optical sorting). Infrared light reflects differently from different types of polymers; Once identified, a jet of air shoots the plastic into the corresponding container. MRFs can only collect and recycle some plastic polymers and send the rest to landfills or incinerators. The separated materials are packed and shipped to the facility's shipping dock.

Recycling efficiency:

Nowadays we are aware of the importance of recycling and the impact it generates on the environment. That is why there are more and more organizations oriented to the processing of I will fall back and therefore to care for the planet. Although it is necessary for recycling to expand to more sectors, we must not forget about its efficiency, since, in order to have the greatest environmental impact, it is necessary for plants to have the best technologies available in order to guarantee that The process will happen quickly and economically.
One of the most important points is the alarming amount of waste we generate as a society. This is reflected in a UN report, where it states how the world produces more than 2 billion tons of garbage per year, and it is likely that this figure will continue to increase if significant measures are not taken. This accumulation of waste has a direct impact on our environment, contributing to air, soil and water pollution, the depletion of natural resources and climate change.
Recycling efficiency means optimizing processes to handle more waste in less time, reduce energy consumption and minimize waste generation during the recycling process. For example, sorting waste is a crucial step in the recycling process. If done manually, this process can be slow, expensive, and error-prone. Efficient recycling plants implement advanced technology, such as artificial intelligence (in small processes) and automatic sorting systems, to improve the speed and accuracy of this process.
Efficiency in recycling plants also has an economic impact. A more efficient recycling process requires less energy and resources, which can translate into lower operating costs. Additionally, it can lead to the creation of new high-quality products and materials, which can generate new business and employment opportunities.
Last but not least, more efficient recycling plants can also improve our relationship with the environment. By optimizing the way we manage our waste, we can reduce our reliance on landfilling and incineration, which are environmentally harmful practices. Additionally, we can reduce our dependence on natural resources by reusing the materials we have already extracted and processed.
In conclusion, it is clear that we need more efficient recycling plants to address the growing challenges of waste management. It is not only an environmental necessity, but also an economic and social one. Recycling efficiency can drive innovation, create economic opportunities and, most importantly, take us one step closer to a sustainable future. It is a call to action for governments, businesses and societies in general to invest in technology and innovation in recycling, and thus turn our waste into valuable resources, instead of waste destined for landfill.

Private recycling company

M.R.F. (Material Recovery Facility)

It is a materials recovery facility is a specialized plant that receives, separates and prepares recyclable materials for marketing to end-user manufacturers. Generally, there are two different types: clean and dirty materials recovery facilities.

Clean materials: A clean material accepts recyclable materials that have already been separated at the source from municipal solid waste generated by residential or commercial sources. The material is graded to specifications, then packaged, shredded, compacted, or otherwise prepared for shipment to market.

Dirty materials: A mixed waste processing system accepts a stream of mixed solid waste and then proceeds to separate the designated recyclable materials through a combination of manual and mechanical sorting. Sorted recyclables may undergo additional processing necessary to meet technical specifications set by end markets, while the remainder of the mixed waste stream is sent to a disposal facility, such as a landfill.

Public recycling center

The City Recycling Center (CRC)

It was created with the objective of treating the different fractions of urban solid waste that were destined to be landfills. The main objective of the CRC is to valorize the waste by transforming it into raw material to reintroduce it into different industries. The materials that arrive at the CRC from different collection circuits enter each plant and begin a specific transformation process to be recovered.

The debris that is collected through the scheduled collection of 147 and dump companies enters the aggregate plant of the City Collection Center where after the entire process they are converted into grain and rubble that are reused to be part of new construction works. construction.

The remains of the pruning carried out in the City, that is, the branches and trunks collected by 147, also enter the CRC passing through the forestry plant. This is where they are cut and crushed in different sizes to end up as material for floor structures. PET bottles have a plant especially for them where they are washed, separated by color and crushed until they become plastic flakes. With this entire process completed, they leave the Recycling Center with added value, to later be clothes, new bottles, buckets and brooms.

All paper, cardboard, plastic, glass and metal collected inside the City's green recyclables bins go to the Automated Green Center. After passing through the separating machine, they are baled according to the type of material and finally the Urban Reclaimers cooperative can sell them so that they become new objects.

Dangerous work situations in centers

Recycling at an industrial level translates directly into waste management, but this entails risks for both the environment and workers.

There are different risks of a recycling company in all its operations. Well, although the majority of waste that reaches waste recycling plants is harmless, the presence of dangerous remains resulting from uncontrolled dumping should not be ruled out:

During manual waste separation:

Those people in charge of separating waste, as well as the rest of the processes that involve its constant manipulation, are exposed to multiple health risks, which can be:

Physicists:

Minor or major injuries, wounds, cuts, punctures, crushing:

- For handling materials such as metal, glass, wood and sharp and sharp objects.
- By using stilettos and knives in the process of preparing materials. Due to driving on uneven and slippery floors.
- Due to the use of damaged compactors, without preventive maintenance, without intrinsic safety mechanisms or due to lack of training for their operation. Serious injury or death.

- Due to being run over, crushed, hitting moving objects, vehicular traffic, heavy machinery, falling from a different level or collapsing of materials in the work of stockpiling, recovery, collection and transportation.

Injuries or death due to exposure to crime:

- Blows or accidents due to falls when moving bulky loads that hinder visibility.

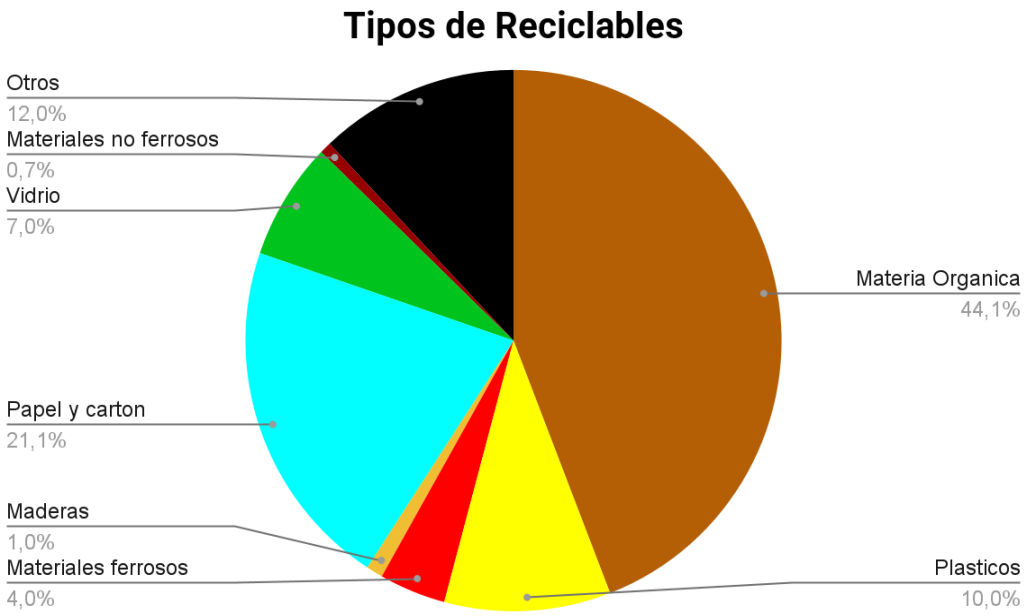
Diseases:

- Due to exposure to high temperatures, solar radiation, exposure to rain and extreme cold during harvesting work; Dust and fiber released from paper and cardboard in sorting and preparation; Due to exposure to gases and vapors emanating from decomposing garbage in recovery and classification activities at temporary storage points in restaurants and shopping centers, transfer points, landfills and dumps.
- Serious diseases such as Hepatitis B and C, HIV due to contact or inoculation with infected material (waste from hospitals, clinics, drug addiction treatment centers), generally waste contaminated with viruses.
- Infectious and parasitic diseases due to contact with germs carried by vectors such as rats, mice, cockroaches, flies, etc. among the waste that is handled. By ingesting food at the workplace and without prior hand washing.
- Musculoskeletal diseases, especially involvement of the spine due to lifting loads weighing more than 20 kilograms repeatedly, in material recovery tasks, loading and unloading of the collection truck, mobilization of heavy objects such as rubble, metal, wood in waste dumps and dumps. Forced position (repeatedly or sustained hunching) in recovery and classification work. Standing position throughout the day in classification activities; Sitting position for several hours and without an adequate seat during material preparation tasks.
- Injuries to shoulder joints, elbows and wrists due to activity
  repetitive (use of the same muscle groups and joints) during exercise
  day, especially in classification and preparation of materials.

Psychological:

- Demotivation, isolation, low self-esteem due to discrimination and poor treatment in interaction with citizens for all recycling work, precariousness, exclusion and informality.
- Depression when family problems, abuse and violence, alcoholism or drug addiction are added to oneself or those of children or relatives.
- Unrest.

Waste types chart:



Frequent questions

Are jobs lost in the implementation of the ASDO project?

When submitting the proposal A.S.D.O., this is one of the most recurring questions, since, although its intention is to guarantee the safety of personnel and at the same time promote the recycling process, we are aware that at the time of implementing the system, those workers dedicated to The sections mentioned above will be displaced. That is why, in addition to working on the development of technology and research, we dedicate a specific section to the labor reorganization that would be caused by the implementation of A.S.D.O

As a first measure, we have the implementation of training for the subsequent referral of employees to various positions required for the correct functioning of the new system. Since although a section of the process is going to be automated, it is important to have trained workers for the maintenance, start-up and control tasks of the different infrastructures. With this we would have a part of the workers reassigned to safe work sections, but given the nature of the automation, it does not have a large number of spaces necessary for its operation. This is where the second proposed measure comes in, which consists of the referral of separation personnel to subsequent tasks, such as: Processing, packaging, distribution and treatment thereof. Although this may be taken as unnecessary, given that it is natural to think that the current number of workers covers the needs, the efficiency factor must be taken into account. A.S.D.O. Since, unlike the manual separator, this is

capable of working constantly 24 hours a day, 7 days a week, without presenting the slightest loss in production. This logically produces a significant increase in the amount of waste that is classified for subsequent treatment, which is why it is expected that the required number of workers dedicated to this work will be much greater than the current one. It can be supplied with part of the workers displaced by A.S.D.O.

What is the positive impact of A.S.D.O. about the workers?

It is normal to think that if so many precautions were taken when proposing the project regarding the reorganization of workers, the idea is to generate a positive impact on them as well as on efficiency. And nothing could be further from the truth, given that the main purpose of the project is aimed at avoiding the exposure of employees to unhealthy conditions.

The main risks to which they are exposed every day come from the existence of dangerous materials that can be found in the garbage. such as chemicals, flammable, toxic, corrosive or explosive materials. Hazardous waste can come from various sources, such as industry, agriculture, mining, etc. It is important to properly manage hazardous waste to minimize risks to human health and the environment. This may include proper storage, transportation, treatment and disposal.

What does the project cover? A.S.D.O.?

Although the acronym A.S.D.O. They refer to “Automatic System of Differentiation and Organization” which translated into Spanish would be “Automatic System of Separation and Differentiation”, the project covers much more than just that. And in addition to the industrial part of it, we seek to carry out an awareness campaign on recycling as well as research work to maximally improve the working condition of waste management personnel and on new technologies, capable of improving efficiency and reduce the negative impact on the environment.

How can we be sure that the A.I. can recognize waste?

A point that generates some uncertainty when considering the implementation of A.S.D.O. It is the effectiveness of its recognition. Although this is detailed in the section dedicated to artificial intelligence, it does not hurt to give a small, somewhat simpler summary.
The detection of waste, as we already mentioned, comes from an A.I. Which based on parameters defined by a complex training process determines the characteristics of each element. This training is carried out with a set of image files where the residues can be seen and a set of “labels” in charge of defining the specific position of the residues and their type. With this, a classification model is trained. There are a variety of models, specifically we work with YOLOv8x which, broadly speaking, is a model that requires greater computing power but in exchange offers much more precise results. This is why we take the results as reliable.