

# Addressing Excess PET-Type Plastic Waste in Viale: Using a Plastic Extruder Machine for Recycling and Manufacturing

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**Summary**— Around the world, non-biodegradable waste poses a significant challenge. The central focus of this article is the pollution caused by polyethylene terephthalate (PET) in the city of Viale, highlighting its impact, causes and consequences. The lack of an efficient waste management system in Viale has led to a massive accumulation of plastics, affecting streets, parks and the quality of life of the inhabitants. The key proposal is the implementation of a PET extruder machine to address this problem. The presentation is organized as follows. First, the context is described, showing the city of Viale and the place where the project will be carried out. Second, images will be shown to help understand the problem. Third, the causes that give rise to this problem are shown as well as its consequences in the city. Finally, the solution will be presented, along with an action plan. This work aims to raise awareness about the real and visible impact of non-biodegradable plastics in the city of Viale. By means of this paper, we intend to promote more sustainable and responsible waste management to drastically reduce plastic pollution in this city. Also, it is important to consider that the PET extruder machine can improve the inhabitants 'quality of life and contribute to a cleaner and healthier environment for all.

**Keywords:** Extruder machine, PET, pollution, recycling

**Resumen**— En todo el mundo, los residuos no biodegradables plantean un desafío significativo. El enfoque central de este artículo es la contaminación causada por el tereftalato de polietileno (PET) en la ciudad de Viale, destacando su impacto, causas y consecuencias. La falta de un sistema de gestión eficiente de residuos en Viale ha llevado a una acumulación masiva de plásticos, afectando calles, parques y la calidad de vida de los habitantes. La propuesta clave es la implementación de una máquina extrusora de PET para abordar este problema. La presentación se organiza de la siguiente manera. En primer lugar, se describe el contexto, mostrando la ciudad de Viale y el lugar donde se llevará a cabo el proyecto. En segundo lugar, se mostrarán imágenes para ayudar a comprender el problema. En tercer lugar, se presentan las causas que dan origen a este problema, así como sus consecuencias en la ciudad. Finalmente, se presentará la solución, junto con un plan de acción. Este trabajo tiene como objetivo concienciar sobre el impacto real y visible de los plásticos no biodegradables en la ciudad de Viale. A través de este documento, pretendemos promover una gestión de residuos más sostenible y responsable para reducir drásticamente la contaminación plástica en esta ciudad. Además, es importante considerar que la máquina extrusora de PET puede mejorar la calidad de vida de los habitantes y contribuir a un entorno más limpio y saludable para todos.

**Palabras clave:** Máquina extrusora, PET, contaminación, reciclado

## I. INTRODUCTION

The big problem with plastic is its massive accumulation in the environment. This has a negative impact on ecosystems, wildlife, and human health. Plastic does not readily biodegrade and can persist in the environment for centuries.

In Viale, there is only one waste separation chamber where plastics are compacted into cubes and then transported. However, this is not enough to handle the amount of plastic discarded every day by the city's 14,000 inhabitants.

The purpose of the presentation is to address the issue of plastic accumulation in Viale, which negatively impacts the environment due to plastic's non-biodegradable nature. A possible solution to this problem, which is already in use in several large cities in the area, is a polyethylene terephthalate (PET) extruder machine. This piece of equipment aims to give PET plastics a second chance through a short smelting process. This project seeks to present this innovative waste recycling method to the city of Viale, which may also generate income from the resulting product.

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## II. PROBLEM DEFINITION AND ANALYSIS

### A. Description of the Context

Viale is a small town situated between Route 32 and Route 18. It is approximately 50 kilometres away from Paraná [Fig. 1].

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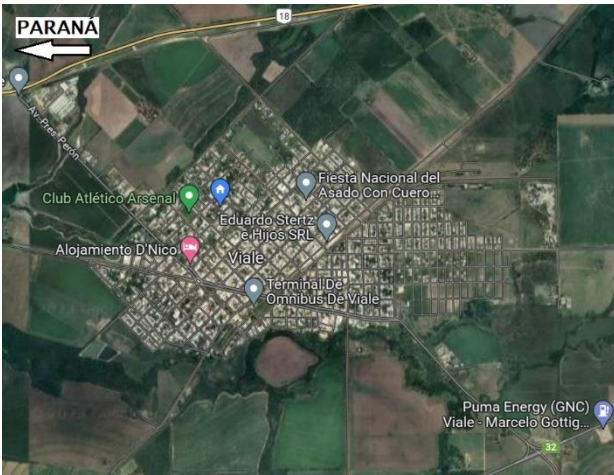


Fig. 1 Map of Viale.

As can be observed in Fig. 2, the city is divided into three sectors for garbage collection with its respective schedules. Also, Mondays, Wednesdays, Fridays are designated for organic garbage collection and Tuesdays, Thursdays and Saturdays are for inorganic garbage.



Fig. 2 Garbage collection sectors

In Sector 2 [Fig. 2], the Viale garbage landfill is in the east of the city. Inside it, the waste separation chamber is situated [Fig. 3].

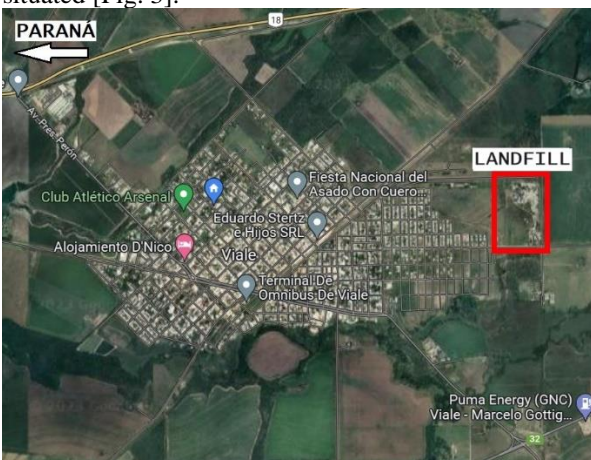


Fig. 3 Location of the landfill.

In the past, the city landfill was designed to be far away from the city. However, due to the city's growth, the landfill is now very close to people's houses. This is a problem because the accumulation of garbage is growing too [Fig. 4].



Fig. 4 Houses' proximity to the landfill.

### B. Problem Statement

Viale faces a big problem that is related to the excessive presence and inadequate management of plastics. This problem arises because citizens use a lot of plastic products, such as bottles and bags. Also, some people do not throw their plastic away in the right manner, and this makes the problem even worse.

As a result, there is an accumulation of plastic waste throughout the city. This is visible in streets, parks, water streams and mainly in the city landfill which is in the east area of Viale. The lack of proper waste management worsens this problem.

### C. Description of Scenes that Help Picture the Problematic Situation

Plastic contamination becomes visible in many contexts, which affects the lives of Viale's citizens. There are many scenarios that can help understand the problematic situation.

In Fig. 5 it can be observed that the residents of the city create "mini garbage dumps". As this picture shows, they throw plastic waste into streams or various tributaries of the city.

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Fig. 5 Highly polluted water stream.

People also create small garbage piles in the streets [Fig. 6]. This especially happens in the most vulnerable neighbourhoods. As illustrated in this figure, residents dispose of various types of waste, but plastic materials are the most frequently found in these piles.



Fig. 6 Mini garbage dump in the street.

Occasionally, people burn waste in the city landfill. This is done to eliminate the surplus plastic that cannot be recycled. This practice results in a cloud of smoke that sometimes covers the entire city [Fig. 7].



Fig. 7 Waste burning in the city landfill.

#### D. Identification and Analysis of Causes or Factors that Give Rise to the Problem

There are different factors that have a negative impact on this situation. On the one hand, increased consumption of products in plastic packaging, such as bottled beverages, food in plastic packaging, and disposable products, can contribute to excess plastic. Viale residents and visitors are using these products in large quantities.

On the other hand, in some remote areas of this community, a lack of sustainable alternatives to plastic products, such as reusable water bottles or cloth shopping bags, can make it difficult to reduce plastic use.

Furthermore, a lack of information on how to properly separate and dispose of plastic products can lead to improper disposal and illegal dumping of waste.

#### E. Identification and Description of the Consequences

There are a series of negative consequences connected with plastic pollution. In this regard, poorly managed plastic can end up in the town's streets, parks, streams, and other natural spaces. This generates visual pollution and damages the aesthetics of the environment.

In addition, plastic waste clogs drainage systems and storm drains, causing serious flood, as those that have hit Viale in recent times. The accumulation of garbage in drains and sewers leads to great flooding incidents in the city (Fig. 8).

Moreover, the burning of plastics has disastrous effects because it causes the release of toxic chemicals. These chemicals affect both the air quality and people's respiratory health.

In general, excess plastics in a small town like Viale can have detrimental effects on the environment, the city's infrastructure, as well as the public health.



Fig. 8 Flood of May 24, 2023, in Viale.

### III. THE WAY FORWARD

#### A. Problem Approach

A highly effective solution to address the growing problem of plastic pollution and properly manage plastic waste is the implementation of a polyethylene terephthalate extruder machine [Fig. 9], which is a piece of equipment designed to process PET, a common type of plastic widely used in beverage containers, bottles, textiles, and other consumer products. This machine has become an essential pillar within the framework of the circular economy, which

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seeks to reduce, reuse, and recycle plastic materials to minimize their impact on the environment and promote a sustainable cycle of production and consumption.

The extrusion process involves heating and melting recycled plastic, which is then forced through a die to shape it into a continuous profile. This technique allows PET waste to be transformed into useful and functional forms, such as boards, pipes, sheets, filaments, or even granules that can be used as raw material to manufacture new products.



Fig. 9 PET Extruder Machine. [1]

The PET extruder machine can process recycled plastic from various sources, including water bottles, food containers, and other PET waste. This waste is collected, separated, and cleaned to remove impurities before being fed into the extruder. Once inside the machine, the plastic is melted at high temperatures and transformed into a viscous mass that can be moulded into the desired shape as it moves through the die [Fig. 10].

#### Extrusion of polymers

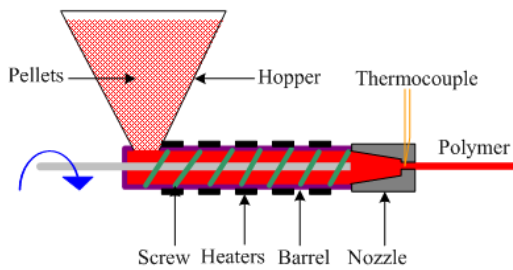


Fig. 10 PET Extruder's Process. [2]

One of the key benefits of using a PET extruder machine is its ability to produce high-quality recycled materials, with properties like those of virgin plastic. This means that the recycled material obtained through extrusion can be used in the manufacture of new packaging, automotive components, textiles, and other products, without compromising quality or performance. In addition, extrusion allows different types of recycled plastics to be mixed to obtain specific properties according to the needs of the application.

By adopting the PET extruder machine in Viale, it is possible to close the life cycle of plastic materials, thus reducing dependence on natural resources and reducing the amount of plastic waste that contaminates the town. This contributes to more efficient and sustainable management of plastics, in addition to promoting the circular economy by reintroducing recycled materials into the manufacturing process.

#### B. Strengths and Weaknesses of the Proposal

In the implementation of a PET extruder machine as a solution to address plastic pollution and manage plastic waste in Viale, various strengths and weaknesses are identified.

As far as the strengths are concerned, these are:

- Efficiency in recycling: The PET extruder machine transforms recycled plastic into useful and functional forms with properties like virgin plastic. This improves recycling efficiency and promotes the reuse of materials.
- Product versatility: The extrusion technique makes it possible to create a wide range of final products, such as sheets, filaments, and films, adapting to various manufacturing needs.
- Waste reduction: By recycling discarded plastics through this process, a significant contribution is made to reducing the number of plastics accumulated in the environment and mitigating plastic pollution.
- Promotion of the circular economy: The PET extruder machine promotes the circular economy by reintroducing recycled materials into the manufacturing process, thus reducing the demand for virgin raw materials.

Regarding the weaknesses of this proposal, the following aspects should be noted:

- Energy requirements: The extrusion process demands high temperatures and pressures, which entails considerable energy consumption. The source and sustainability of this energy must be considered to mitigate environmental impacts.
- Limitations on waste composition: The quality and composition of the collected plastic waste may vary, which may affect the efficiency and quality of extrusion. It is crucial to ensure a homogeneous and high-quality waste feed to obtain optimal final products.
- Possible contamination in recycling: The PET extruder machine requires rigorous cleaning and separation of plastic waste to avoid impurities. Inadvertent contamination can negatively affect the quality of the recycled product.

#### IV. CONCLUSION

In conclusion, the city of Viale faces a significant challenge related to the excessive proliferation and improper management of plastics, caused by the massive use of plastic products, such as bottles and bags, and the inadequate disposal of this waste by citizens. This problem has led to an alarming accumulation of plastic waste in various places in the city, being evident in streets, parks, waterways and, especially, in the city landfill. The lack of proper waste management aggravates this problem by allowing plastic waste to accumulate in public spaces.

To address this situation, the implementation of a PET extruder machine is proposed as a highly effective solution. This technology offers numerous advantages, including the ability to transform recycled plastics into materials with properties like virgin plastic, thus promoting efficiency in material recycling and reuse. In addition, it allows the

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versatile manufacturing of various final products, contributing to reducing the number of unused plastics and promoting the circular economy by reintroducing recycled materials into the production process.

However, certain weaknesses are recognized in the proposal, such as the high energy requirements of the extrusion process and the need for specialized technology. These aspects must be addressed through careful planning and considering sustainable energy sources. In addition, the quality and adequate composition of plastic waste must be guaranteed to avoid contamination in the recycling process.

In summary, the implementation of the PET extruder machine in Viale represents a comprehensive and effective solution to combat plastic pollution and adequately manage plastic waste. Its adoption will not only contribute to mitigating the current problem but will also lay the foundations for more sustainable management of plastics in the city, thus promoting a cleaner, healthier environment that is in harmony with its natural environment.

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The present project is a skills integration activity in Inglés I at Universidad Tecnológica Nacional, Facultad Regional Paraná, carried out by EFL engineering students. The yearlong project requires students to delve into a problem in the city where they live and to address it by means of a simple project in English. Should the reader have any questions regarding this work, please contact Graciela Yugdar Tófaló, Senior Lecturer, at [gyugdar@frp.utn.edu.ar](mailto:gyugdar@frp.utn.edu.ar).