POSITION PAPER

a resource for the **present** and the **future**

Plastic in the age of environmental, social and economic sustainability.

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01 Introduction

The Position Paper "**A resource for the present and the future**" sets out MPG's view of the significance of the current and future role of plastic, which can drive dramatic changes in consumption and lifestyles, and how, as a consequence, MPG interprets its own work as a complex social agent in a context where plastic is indispensable yet simultaneously under attack from certain ideologies.

While the criticism is reasonable in some cases, in others, as we shall see, it is taken to an extreme that is of little help either in finding solutions to the problems highlighted by the criticism itself, or in defusing a climate of hate for a material that, in the final analysis, is one of the symbols of modern life and the product that, unquestionably, has improved our lives over the years (even in environmental terms).

As the title of this paper suggests, MPG believes that plastic is not a product to be demonised; on the contrary, as history shows, today it is – and in the future will continue to be – a **resource to be used** for everyday items, to protect foodstuffs, to give form to ideas, projects and innovations.

Nevertheless, if we want to make full use of the opportunities offered by plastic, a three-pronged approach is unavoidable, and involves:

- going beyond preconceptions to analyse the **real impact** of plastic as a whole, not simply in terms of individual items
- the assumption of **responsibility by producers** and organisations active in technological development and waste disposal/recycling
- the assumption of **responsibility by private** individuals through behaviour that protects the environment and circularity

The contribution described in this paper presents MPG's point of view and "credo": it is not a neutral stance, of course, but we believe it offers a balanced view because, as we explain, it acknowledges the at times clearly difficult overall situation, but also finds and offers solutions that are – already! – an integral part of our company's life and production processes.

02 Plastic, a symbol of modern life

Plastic is a product, a synthetic material, which has been part of our lives for decades and supported our changing lifestyles, even though – as the numbers show – **half of all plastic has been produced in the last 15 years**, with an exponential increase from 2.3 million tonnes in 1950 to more than 430 million tonnes in 2023. Estimates indicate that this figure could double by 2050. The progression in the production and use of plastic is the result of many discoveries and studies that, since the late 19th Century, have generated innovation in the world, as exemplified by these dates:

- The first semi-synthetic plastic material – **Xylonite** – was produced in **1862**;
- In **1870** a patent was taken out on the formula for celluloid, which replaced ivory as the raw material in the manufacture of billiard balls. So even then, plastic had a **significant environmental impact** by saving the lives of elephants, which until then had been slaughtered so the ivory from their tusks could be used for billiard balls, among other items;
- The first entirely synthetic plastic, **Bakelite**, was produced in **1907**;
- Polyvinyl chloride (**PVC**) was invented in **1912**, **cellophane** in 1913. The explosion in the use of PVC, however, came only much later, with the second world war, when the difficulty of finding traditional raw materials because of the conflict made it necessary to manufacture products with other materials;
- The **1920s** saw the introduction of **petroleum** in the production of plastic compounds, marking the start of the first real plastics industry;
- **Nylon** was created in **1935**, a synthetic plastic fibre immediately used for parachutes and women's stockings (and never abandoned since), while polyethylene terephthalate, PET, whose textile fibres are still known today as "polar fleece", was patented in 1941;
- PET was introduced into **food packaging** in **1973** when the first plastic bottle was patented;
- In the **1950s** came the discovery of **Formica** (formaldehyde-melamine resin), used for the production of low-cost furniture and kitchenware, and of **Polypropylene** (PP), the latter attributable to Giulio Natta, who was awarded the 1963 Nobel Prize for chemistry for the project; the industrialisation of PP led to the Moplen brand and inaugurated the modern lifestyle with plastic objects and furnishings appearing in houses all over the world;
- The **1960s** consolidated the role of plastic in daily life and also saw it move into other areas such as design, art and fashion;
- The **1970s** brought in technopolymers like **Polymethylpentene** (TPX), used for the production of items for clinical laboratories, Polyamides,

which are used in the automobile industry, Polycarbonates, which are also employed in the manufacture of space helmets, as well as Ionomers, Polysulfones, Polyphenylene sulfide, Polybutylene terephthalate, and many others.

This progression, in many ways surprising shows how plastic has always been an **authentic and affordable alternative to less "sustainable" materials** used in previous decades. Many materials regarded as ecological actually use huge quantities of energy in their production, much more than the levels required to produce and process plastics.

Plastic has also enabled the development of technologies and objects that have revolutionised medicine with life-saving devices, made automobiles and jets lighter, cutting pollution and fuel consumption, saved lives with helmets, incubators and water-purifying equipment.

Lastly, plastic has established a place in the popular imagination as the example of the conquest of prosperity and a better quality of individual and collective life. It is the material that embodies the democratisation of consumption.

03 The problem of the linear economy, irresponsible behaviour and lack of information

The substantial "practicality" guaranteed by plastic has led to its mass consumption, use in numerous fields, and driven research into further innovations to make it even easier to produce and use.

At the same time, the other characteristics of plastic – its durability and near indestructibility – combined with its practicality have generated a series of **pollution-related** problems, essentially due to the spread of a "throwaway culture": today, **mono-use plastics** account for at least 40% of all plastic produced every year.

The lifetime of many of these products, such as plastic bags, is a few minutes or a few hours, even though they remain in the environment for hundreds of years (these at least are the estimates in the absence of a specific scientific study).

However, a basic misunderstanding has grown up around the issue of plastic and the pollution caused by this type of product, fuelling a "witch-hunt" that lays the "blame" at the door of the manufacturers of plastic goods while "absolving" the people who buy them and, for now at least, turn them into waste.

Yet is it really possible, in a market economy, that responsibility for what could be called the externalities be attributed solely upstream, or should **other factors** be taken into consideration?

Given these considerations, all the active parties of an economy need to redefine their production models, their consumption models and the way materials are recovered.

There is no doubt that the throwaway culture and, more generally, the logic of the linear economy – together with limited environmental awareness – have created and stratified forms of behaviour whose outcomes are the environmental fall-outs we are talking about: "take – make – dispose", the triad on which the linear economy is based, and whose shortcomings are plain to see.

On the one hand, finite resources cannot produce infinite products. On the other, even if they could, it would not be possible for continuous production to be absorbed indefinitely in every sector for every product.

Given these considerations, all the active parties of an economy need to rethink their production models, their consumption models and the way materials are recovered. As we shall see in the next section, a real transition to the **circular economy** needs to be activated by establishing a broad-based lasting pact that takes account of the needs and responsibilities of **producers, transformers, consumers, recycling and recovery operators and institutions**, keeping clearly in mind that this is a question of managing complexity, which, as such, is often not examined at all or, at best, only partially.

Simply by looking at reality as a complex whole, with the help for example of Life Cycle Assessments (LCAs), a startling fact becomes clear: **plastic is more eco-friendly**.

Part of the complexity lies in considering realities
that seem incredible. One such example is that, despite what many people think, plastic is one of the **most ecological materials we can use**.

Simply by looking at reality as a complex whole, with the help for example of **Life Cycle Assessments** (LCAs), a startling fact becomes clear: plastic is more eco-friendly than many other supposedly "green" materials.

The LCA analyses the entire life cycle of a product "from cradle to grave"; in other words, from the moment the material for the production of the item is extracted and processed to the final disposal of the product, including transportation, distribution, use, and not forgetting the energy required in the various stages and the resulting atmospheric emissions.

Because of their **specific gravity** and **the energy consumed** over their life cycle, some materials are more harmful to the environment than plastic, which, being lighter, requires much less energy to be produced, transported and recycled.

And what to say about the **replacement** tout-court of plastic packaging for foodstuffs or cosmetics with packaging in other materials? In this case too, the overall environmental impact of one-to-one replacement of plastic packaging with other products generates an **environmental deficit**, as well as causing other difficulties: in many cases, there is no better container than plastic for the transportation, distribution and storage of foodstuffs while guaranteeing their quality.

A study conducted by the UK Environment Agency[1] shows for example that the overall impact of a paper bag used to replace a plastic bag is 70 times

1 https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/291023/scho0711buan-e-e.pdf?utm_source=npr_newsletter&utm_medium=email&utm_content=20190408&utm_campaign=money&utm_term=nprnews

higher in terms of the "cradle to grave" energy requirement.

The study "Plastics and Sustainability: A Valuation of Environmental Benefits, Costs, and Opportunities for Continuous Improvement" calculates that the replacement of plastics with alternative materials could raise environmental costs from 139 to 533 billion dollars a year. The reason is always the same: plastic materials, which are light in weight and able to protect content even with thin layers, require fewer resources and deliver benefits over the entire product life cycle. In turn, **the use of more sustainable plastics could reduce the environmental costs**. The same study concludes that the environmental cost of disposing of waste in the oceans, a key issue in the debate on plastic, would be even higher if plastic is replaced with other materials, seven billion dollars rather than five.

Choosing more sustainable plastics could reduce environmental costs to a greater extent than replacing plastics with other materials, wrongly considered more sustainable

It is clear that the focus needs to be shifted as quickly as possible from plastic as such, **to the way plastic is used** and what is done with it, in an attempt to intervene not on the plastic "life cycle", which, we have seen, is more virtuous than others, but on what could be described as the "**death cycle**", in other words, how plastic waste is produced in the first instance and then treated.

A single figure provides sufficient illustration: Europe currently recycles about 30% of the plastic used to produce packaging and the European Community has said that 70% of the plastic disposed of as waste must be recycled by 2030. The rest is incinerated or sent to landfill, causing some of the problems we are all aware of today.

Italy is more virtuous than Europe since **its recycling rate measured by the latest inspections is 71.5%**. So what can be done to make the best use of the opportunities offered by plastic and the packaging and products made from it, while keeping faith with the commitment to protect the environment? Only one thing: we have to move to the circular economy where everyone involved plays their part.

Italy is more virtuous than Europe since its recycling rate measured by the latest inspections is **71,5%.**

04 Possible solutions: the circular economy and the use of alternative materials

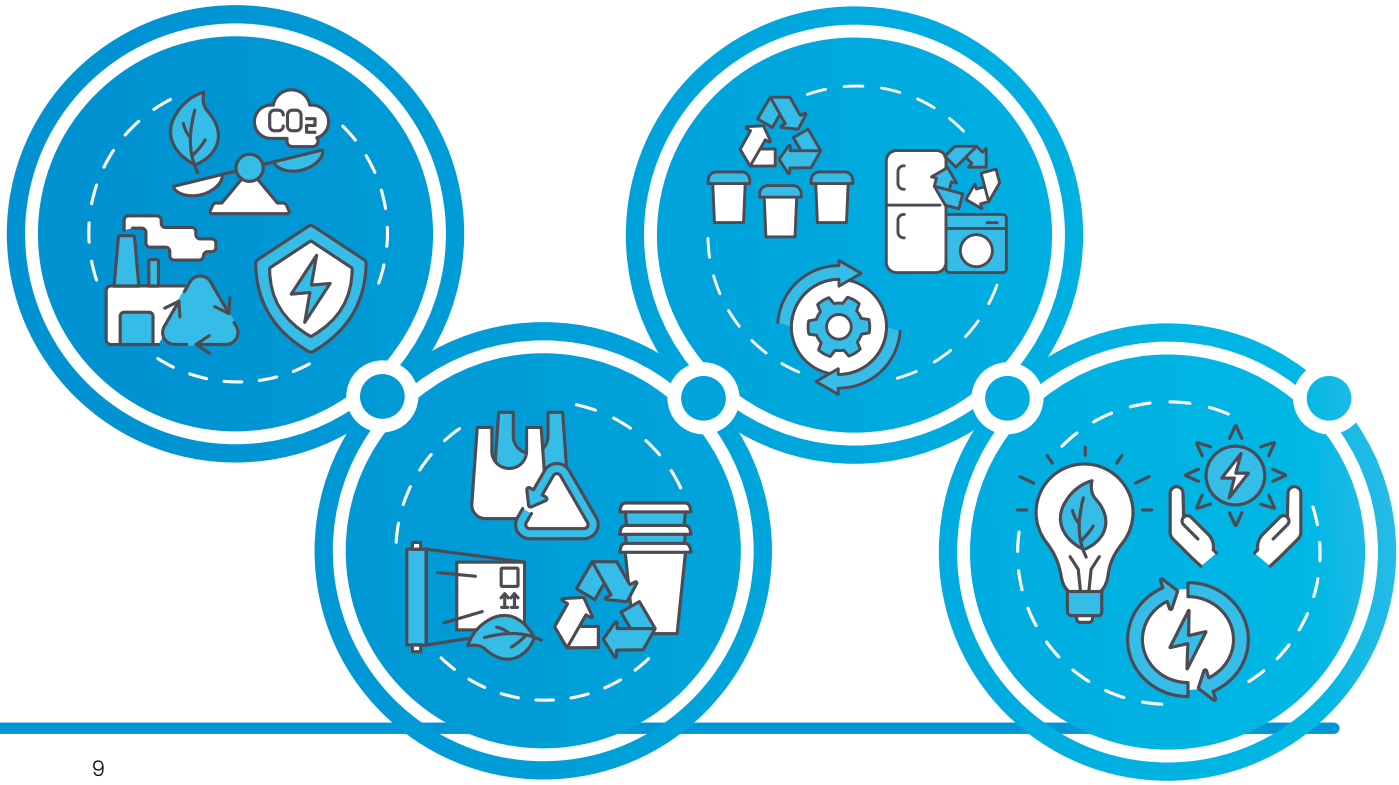
The solution, therefore, lies in the **circular economy** supported by the assumption of responsibility by everyone in the "plastic supply chain".

The circular economy replaces the "take – make – dispose" model with "**Reduce, Reuse, Recycle**", that is, reduce consumption (and consequently production), reuse products where possible and recycle as much as possible to give materials a second (or third, fourth, ...) life.

However, this cannot be achieved simply by working at the production level if the innovations (in design, infrastructure, politics-institutions) needed to support and accompany the **transition** are absent.

The circular economy requires products to be thought out "from a circular perspective", in other words, **it should be clear from the start what will happen to them at the end of their life cycle**, how they can be recovered and transformed, in what sort of quantities, with which resources and with a clear environmental impact for the entire production process.

Establishing this approach is complicated, but it brings together the skills and requirements of everyone involved, in a sort of "**shared eco-design**" of products and processes.



Action is needed at 4 levels:

01. technological and process innovation
02. suitable infrastructure for the recovery and recycling of plastic
03. widespread segregated waste collection
04. environmental education

01. Technological and process innovation

When talking about technological and production process innovation, both the **choice of materials** used to manufacture plastic products and their **design** should be considered to ensure that the products foresee their subsequent transformation and can be reused after their primary use (for example, the shoppers in various materials commonly found in every house) or because they are the second prime material of a new production process known today as upcycling.

02. Suitable infrastructure for the recovery and recycling of plastic

As observed earlier, one of the most obvious problems is that about 70% of the plastic produced in Europe (and the percentage is even higher elsewhere, starting with China) is not recovered and recycled, but sent to landfill or incinerated. The root cause lies in the collection stage (even though this has improved greatly, with Italy ranking first in Europe[2]), and the **lack of widespread technologies and tools** to implement recycling.

Moreover, recent studies, The Circular Economy for Plastics – A European Overview[3], show that recycling of plastic waste is **10 times higher when plastic is collected separately**.

The method used most often to recycle plastic is mechanical, with waste transformed into raw materials or secondary products without any change to its chemical structure.

2 https://www.cial.it/litalia-in-cima-alla-classifica-europea-per-il-riciclo-degli-imballaggi/

3 https://plasticseurope.org/knowledge-hub/the-circular-economy-for-plastics-a-european-overview-2/

All thermoplastic products can be recycled mechanically, in principle at least, and this methodology has obvious environmental advantages since it replaces the virgin raw material with a material that has already been used and is in a satisfactory state.

When a mechanical process is not possible, chemical recycling can be used to modify the chemical structure of plastic packaging, converting it into molecules for new chemical reactions. Examples include gasification and pyrolysis, which cause plastic waste to decompose until it produces syngas as well as other liquid and semi-liquid products.

Chemical recycling can help prevent plastic waste that cannot be recycled sustainably with mechanical processes from being sent to landfill. Plastics suitable for chemical recycling include **laminates and composites**, mixed low-quality plastics and plastics contaminated by food, soil, etc.

Another alternative is **waste-to-energy recycling** in co-generation plants, which process plastic-rich waste fractions that cannot be recycled sustainably.

03. Widespread segregated waste collection

As noted, **the quality and quantity of segregated waste are a necessary but not in themselves sufficient condition for the effective recovery of plastic**. The wider the collection process, the greater the level of segregation, the greater the possibility to recover and recycle plastic.

04. Environmental education

Innovation, collection and recovery will remain at superficial levels unless people **learn to consume and use materials in ways that help improve environmental conditions**.

05 MPG's contribution

MPG has always been committed to **innovation in processes and products**, and to acting as a responsible producer in the complex plastic supply chain. Indeed, our approach **promotes the culture of the circular economy** and **changes in consumer choices**.

A propensity for innovation and constant investment in research and technology are the cornerstones of our industrial development and strategic vision, whose objective is to make a concrete contribution with recyclable, eco-friendly products. MPG has been interested in sustainability ever since we began operations: from the start we offered goods made from **thermoformed polypropylene** (then only from fossil sources), a material with a lower impact than others due to its chemical elements and complete recyclability. Basic polypropylene is composed of carbon and hydrogen. Its specific gravity is also significantly lower than other plastics (by 10% to 40%) so that **items with the same shape have different weights, with those in polypropylene weighing the least**: the direct consequence is that lower volumes of plastic are introduced on to the market.

Similarly, we produce plastic **packaging based on biomass raw materials**, with a lower environmental impact and without the use of fossil sources. This is **bio-based polypropylene** packaging.

Besides confirming our organisation's commitment to sustainability, these products enable brands and corporate customers to increase their own contribution in terms of environmental impact by using a specific traceable product within their supply chain.

Furthermore, food companies that choose this type of packaging from MPG can reproduce on the packs the logo attesting that the sustainable material is certified for ISCC compliance, i.e., that it uses renewable and eco-sustainable raw materials.

MPG was the first company in Italy to obtain ISCC PLUS certification for the production of rigid food containers. We believe it is fundamental to find concrete solutions to the reduction of CO_2 emissions in this context. The real objective is the elimination of greenhouse gases, which raise temperatures on the planet and cause the polar ice caps and glaciers to melt, contributing to climate change.

MPG was the first company in Italy to obtain **ISCC PLUS** certification for the production of rigid food containers

So for us **sustainability** is not a sporadic commitment, but a **concrete project** drawn up for the food industry, a sector governed by strict regulations.

Since 2015 we have invested in R&D to develop solutions for better food preservation. Solutions that are recyclable and so eco-sustainable. The unique certified technology of our polypropylene products, associated with **bio-based polypropylene**, makes a significant decrease in GHG emissions possible. The reduction in terms of environmental impact is clear, the **producer of the raw material declares a saving of up to 2.5 kg of CO_2 per kg of polymer produced** with respect to the production of fossil polymers.

The decisions we have taken and the innovations we have introduced confirm the company's assumption of responsibility, but also reflect its view of the value of plastic, a resource "for the present and the future": instead of banning the use of plastic, the circular economy's «**Reduce, Reuse, Recycle**» approach opens a new opportunity for the management of the traditional plastic life cycle and assists the search for technologies and applications leading to the development of new products from renewable raw materials.

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