

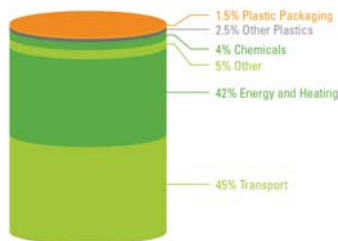
TAKING A MORE BALANCED APPROACH

The current negative publicity surrounding plastics – and in particular plastic packaging – is demonising a material that in reality has done a great deal to support our 21st century lifestyle and which is already making a significant contribution towards the more sustainable future that everyone is seeking.

It is important to remember that the growth of plastics in recent decades is the result of increasing demand – driven by all of us as consumers - across a huge range of sectors, where the material has delivered major benefits and advances. As well as packaging, this includes medical and pharmaceutical applications, agriculture, food handling and processing, and vehicle manufacture to name just a few.

There is also much criticism about the many different types of plastics available. However, this is one of the reasons that plastic has been able to support the modern lifestyle that the majority of us have chosen to lead, as the different types of plastics enable packaging to meet specific application needs.

ONLY 4% OF GLOBAL OIL PRODUCTION IS USED FOR PLASTICS



In fulfilling all these needs, plastic has already demonstrated a strong environmental profile. As markets have become increasingly global, plastics' light weight and ability to pack more containers per load have had a significant impact in minimising the emissions associated with the transportation of goods over long distances. In the food sector, the material's protection and portion control benefits have been a crucial factor in helping to minimise food waste, in itself a far greater environmental problem than packaging waste. Most important, all plastics are recyclable.

Nor are plastics a major drain on our natural resources. For example, only 4% of global oil production is used for plastics and, according to most recent estimates from the British Plastics Federation, packaging accounts for only 1.5% of oil and gas use.

Nevertheless, what is equally irrefutable is that we need to manage plastic at its end-of-life so that it does not leak into marine or land environments as a result of poor waste management or littering. Tackling this issue is essential.

However, the current focus on reducing or eliminating plastics seems to ignore one key fact – that the problem of waste is a man-made issue. Removing one material from the waste stream will result in another taking its place. If goods are not packed in plastic, alternatives will have to be found, and these too may then end up in our seas, rivers and roadsides. Those of us of a certain age may remember when broken glass was a significant problem on beaches and in parks.



surrounding the material, and aims to provide a more balanced view that demonstrates how plastics can remain an important part of our daily lives.



In the packaging sector, plastic has been able to respond to changes and developments in consumer behaviour, such as the growth in convenience foods. Its light weight and durability have ensured much safer handling of products in a wide variety of end markets. Plastics' ability to protect and extend the shelf-life of many foods has enabled us to enjoy what were once seasonal products all year round. The versatility of the material means it can meet the needs of different household compositions, from small individual size packs for single persons to larger size family containers.



At RPC we are committed to supporting the various national and international initiatives focused on creating a sustainable circular future for plastics. We also recognise that although plastics are recyclable, we need to increase recycling levels and this is dependent on the availability of suitable collection, sorting and reprocessing facilities together with increased use of recycled materials in plastic products. Achieving this will support circular economy principles and help to create a system where plastic packaging never becomes waste.

RPC has and continues to invest in enhancing our design and manufacturing practices in order to create solutions that best align with the needs of the circular economy. Our commitment remains to work with our customers to ensure plastics in every application can be used responsibly so that they can continue to deliver their many benefits.

This special edition of RPC Matters focuses on the major issues concerning plastics role in modern life, addresses some of the myths and misinformation

PLASTIC PACKAGING – FAQs

Included throughout this issue are some of the most common questions that are raised about plastic packaging. The information is taken from the British Plastics Federation's booklet Plastic Packaging – Frequently Asked Questions, which can be downloaded at www.bpf.co.uk/polymer-zone.

WHY USE PLASTIC PACKAGING?

To be fit-for-purpose, packaging must protect and preserve. Plastic packaging performs this function particularly well and provides many other advantages for consumers, suppliers and society. Plastic is resource efficient, safe, hygienic, lightweight, secure, durable and versatile. Plastic packaging also plays a key role in preventing food waste and the material can be recycled many times to create new products.



HOW THE CIRCULAR ECONOMY REMAINS AT THE CENTRE

A significant development in the drive to create a more sustainable world has been the move towards a circular economy as an alternative to the traditional linear version of 'make, use, dispose'. Under circular economy principles, the lifecycle of a material is extended as long as possible, with recovery, recycling and regeneration at the end of each service cycle.

The aim is to keep materials, products and components circulating in the economy and not become waste. The circular economy also seeks to maximise the sustainability of the types of resource being used, and control the types of waste leaving the economy.

RPC has adopted circular economy principles by treating the materials we select to manufacture our products as valuable resources rather than disposable ones. This includes the energy and water used to make them. In this way, we can make a contribution to circular principles throughout a product's full lifecycle – from the carbon impact of materials and manufacturing processes to end-of-life options.

For the different stages of the circular economy, we specifically look at the 'reduce', 'substitute', 'reuse' and 'recycle' elements during design and manufacture.

For reduce, we aim to be as resource efficient as possible, both in the amount of material we use and through this, minimising the energy needed for manufacture and transportation. Designs can be tested using methods such as FEA (finite element analysis) software and mould-flow analysis. This allows us to minimise the amount of material we use to create the strength needed to function properly.

Practical examples of what we have achieved using this approach include our launch of the world's first UN approved free-standing 5 litre jerrycan for the transportation of hazardous products, weighing just 130g compared to more typical examples of around 200g. This equates to around a 35% reduction in its carbon footprint. More recently, we redesigned a highly complex pack for the horticulture sector, reducing the number of components in the pack by over 50% for an overall weight reduction of 40%.



In terms of substitution, the lightweight and low carbon attributes of plastics can deliver environmental benefits through their replacement of traditionally heavier materials.

When it comes to reuse, many plastic containers naturally lend themselves to second uses, such as pots for pens, and jars containing screws or nails. The reuse of containers can even provide a USP and point of difference in retail markets, for example buckets for sweets, which consumers are then encouraged to use for storage. Containers for bulk storage and transportation, notably those used in the food processing and fresh fish and meat industries, are easily maintained and cleaned for reuse.

To make packs more easily recyclable, the focus is on areas such as the use of mono-materials where possible or easy separation where not.

Ultimately the aim is to incorporate circular economy principles into our design and manufacturing processes while still ensuring that every pack remains fit-for-purpose and also meets other criteria that help to minimise its overall environmental footprint, such as carbon reduction and preventing food waste.



The EU is currently working on harmonising various waste directives in order to transition to a circular economy. RPC is participating in discussions to help shape this package, and is also collaborating in other external initiatives such as the Ellen MacArthur Foundation's New Plastics Economy. These types of partnership approach are vital in helping to realise the value of plastic and ensure that well-designed and manufactured plastic products can play an active and constructive role in the circular economy.



IS PLASTIC PACKAGING RESOURCE EFFICIENT?

Plastic packaging saves packaging mass, energy and greenhouse gas (GHG) emissions. Without it, we would use 2-3 times more resources. Plastic packaging production uses about half as much energy as alternative materials.

Plastics are also a very lightweight packaging medium, which means less energy is used to transport goods protected by plastic packaging.

PLASTICS - A VALUABLE RESOURCE

All plastics are recyclable – and plastic is a highly valuable material that needs to be recycled as much as possible as part of its contribution to the circular economy. Recycled plastic can become any number of things from t-shirts to insulation to new packaging.

Plastics recycling rates have increased by 64% in Europe since 2006, and nearly eight million tonnes of post-consumer plastic were recycled in 2014. (Source: PlasticsEurope). This has been driven by improvements to collection, identification and sorting of materials.

There have been significant improvements in recent years. According to 2016 recycling rates in the UK, 98% of local authorities collect plastic bottles. Items with previously low rates have achieved notable increases. 74% of authorities collect pots and tubs, up from 28% in 2010, while – albeit from a lower base – collection of plastic film has doubled during the same period. (Source: RECOUP)



Opportunities for the incorporation of PIR and PCR into plastic containers and other products will continue to increase and we are happy to collaborate with customers to explore these possibilities.

In addition, RPC Group includes two business that support the recycling sector. RPC bpi recycled products is Europe's leading polythene film recycler, annually reprocessing over 70,000 tonnes of waste from industrial, commercial, agricultural and domestic sources. This is used in the manufacture of second-life products such as fences, benches and other garden furniture, refuse sacks and construction membranes. More recently, the company has also been involved in a unique initiative to use collected and recycled plastic to repair potholes in roads.

ESE World manufactures a range of waste and recycling bins, which in themselves play a vital role in the collection of materials for recycling. The company also offers a recycling service for waste bins, and to date this has already resulted in the recycling of over four million units.



IF PACKAGING CAN'T BE RECYCLED, DOES IT MATTER?

It is desirable for packaging to be recycled if it can be. However, if a one-trip packaging product consumes fewer resources than a product that can be recycled, it is preferable to use the one-trip packaging, as this will save resources. Products that can't be recycled today may be able to be recycled in the future. In addition, if it is not economically sustainable to recycle something then it is always possible to recover the energy content through energy recovery. This is particularly true for plastics, as the calorific value of plastic packaging is significantly higher than coal.



Nevertheless, globally there are still widely varying recycling levels, mainly due to different collection and recycling infrastructures from country to country and even within countries. Further coordination and improvements are therefore vital.

As well as working with external organisations to help deliver this, RPC has many examples of how recycled plastics can be put to good use. Our design and technical skills have enabled us to incorporate post-industrial recycled (PIR) and post-consumer recycled (PCR) plastics into packs such as paint containers with 25% recycled material, and oil containers, shampoo bottles and paint tester pots with 100% recycled material, while ensuring pack performance and functionality are not compromised in any way. Importantly, the incorporation of PCR in particular can offer excellent branding opportunities and product differentiation as consumers become increasingly environmentally-aware.



Nearly 8 million tonnes of post-consumer plastic were recycled in 2014 in Europe alone.*

*plastics - the facts 2016, PlasticsEurope.



SPOILT FOR CHOICE?

One of major benefits of plastics is the many polymers available. This enables the material to meet the different packaging requirements of the huge variety of products that we consume in modern life.

No single polymer is able to deliver all the necessary benefits for so many applications. Different polymers provide different functions. For example, HDPE has the robustness required to handle chemicals and household products, while also offering ease of forming so that particular shapes can be achieved, such as an angled neck on a bleach bottle to assist cleaning. PET is often used where products – particularly in the food sector - need to be visible on-shelf; there are different polymers available depending on whether the final pack has to be rigid or flexible.

Plastics versatility means it has the properties to deliver contrasting requirements. Plastic film can provide effective tear resistance and also incorporate 'easy tear' functionality for ease of opening. PP, which bends without breaking, is ideal for dual compartment pots where the contents of one are added to the other before eating, while PS is often selected for multipacks of yoghurt, enabling one pot to be snapped off and separated from the others. The strength of PP also makes it an ideal choice for microwaveable meals and where products have to be sterilised at high temperatures.



has led to some calls to rationalise these materials in some way. However, the use of fewer polymers than at present could risk far more to the environment, in terms of the impact of increased product waste and damage.

Every pack needs to be designed and manufactured to perform its required functions. Restricting a particular polymer will limit this ability; there is no 'one-stop' solution. Therefore, while the introduction of bioplastics is another important development in the evolution of plastics, like any other material, they should not be viewed as the solution to all packaging requirements.

Bioplastics is the term for plastics that are biobased, biodegradable or feature both properties. Biobased plastics are either partially or fully derived from renewable sources, for example algae, corn and sugarcane. Biodegradable plastics are those that degrade under certain conditions into natural substances such as carbon dioxide, methane and water. This process relies on micro-organisms in the environment and is therefore dependent on a number of factors including location and temperature.

The benefits of bioplastics include a reduced dependency on fossil fuels and reduced CO₂ emissions during manufacture. However, there are other factors that also need to be considered before selecting these materials. The global population is forecast to increase to 9.8 billion by 2050 which will further increase the pressure on food resources. The biomass source used to make biobased polymers should not be at the expense of valuable food crops.



Whatever the polymer, all plastics are lightweight, non-breakable and have a low carbon footprint. A recent report from Trucost found that the environmental cost of using alternatives to plastics would be nearly four times greater largely due to the additional material that would be needed.

The wide variety of polymers does understandably cause some confusion among consumers, and with the current media spotlight on plastics and their impact on the environment, this



Biodegradable materials can contaminate plastic recycling schemes, whereas biobased polymers can be recycled with oil-based plastics, so effective communication is required to ensure consumers dispose of packs appropriately.

These new materials need to be considered and selected using the same criteria as for any other application – that they are economically viable, available in suitable reliable quantities and offer the same or increased performance for the pack. At RPC we are happy to work with customers to explore the opportunities for such polymers as part of our initial assessment of requirements.

Ultimately, every polymer has an important role to play in creating packaging for today's lifestyles. The appropriate selection of materials will ensure that each pack can continue to support a more sustainable world through effective product protection and preservation as well as its end-of-life options. Allied to this is the move towards a more consistent approach to the collection of used plastic from both households and businesses, and ongoing technical enhancements that will enable the recycling of even more material in the future, even when highly contaminated.

Focusing on these elements will deliver more environmental benefits than limiting the range of materials in use, and mean plastic processors can continue to offer effective solutions tailored to the exact requirements of individual products. The wise use of available polymers remains the key to creating a sustainable packaging system.



WHY DON'T WE USE MORE COMPOSTABLE OR BIODEGRADABLE MATERIAL?

Good environmental practice requires us to use the least material to do the job required, then to reuse or recycle by recovering material or energy from the products we use at the end of their life.

For that reason, most plastic packaging is either recycled or sent to energy-from-waste plants (if recovery for recycling is not the best environmental option).

Where products are not currently collected for recycling it can be because there are high levels of contamination and / or the resources required to recycle simply makes it unsustainable at present. Most presently available compostable and biodegradable materials fail to recover material or energy. Currently, no materials have been proven to adequately biodegrade in the open marine environment.

When packaging can't be easily recovered (because there is a high level of food contamination) and the process of waste management is compatible with compostable material, then compostable materials would be appropriate for returning the nutrients contained in the food.

However, if compostable or biodegradable materials get into the recycling stream, this can have detrimental effects, rendering the recycle unusable. For this reason, where compostable material is used, it is important that this risk is recognised and managed.

DESIGNING WITH SUSTAINABILITY IN MIND

Plastics' design flexibility has been a fundamental reason for the material's success, particularly in the packaging sector. The variety of shapes, sizes and colours means plastic is suitable for a huge number of products in many different end markets, providing the required brand image, functionality, convenience, protection... in fact, whatever is required for each individual product or application.

The material's functionality is an equally important factor in the efficient production of packs, as well as during subsequent manufacturing and filling operations for the products they contain.

Effective design has the ability to influence a pack throughout its lifecycle, and sustainability has a critical role in this process, with solutions that help to minimise a pack's overall environmental impact while still meeting the needs of the manufacturer and filler, and the end-consumer.

In many ways, the renewed focus on sustainability has only formalised design procedures that have been in place for many years. Lightweighting of packs, for example, has been a frequent feature of pack development, and this has helped to reduce carbon emissions in terms of both the use of resources in manufacture and the transportation of finished goods. Design techniques have ensured that the lightweighting is not achieved at the expense of a pack's other benefits so that it remains fit for the purpose of protecting a product throughout the supply chain.

A typical 'design checklist' takes into account the many different factors that can affect a pack's overall sustainability attributes. These include looking at the number of materials used in the pack, and assessing whether they can be reduced, or whether alternative materials are available that could further improve the overall environmental impact. The use of recycled plastic in the production of the new pack is also considered, and the potential



for its reuse or repurposing investigated. Another important factor is the selection of the most appropriate manufacturing technique.

For food applications, the checklist covers opportunities for portion control or resealability as part of the drive to minimise food waste.

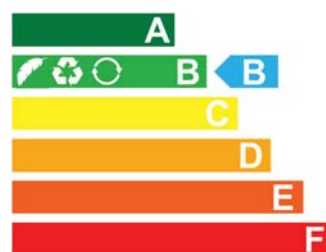
For many packs the best end-of-life solution will be recycling. The checklist therefore encourages the use of single polymers, or a design where different parts can be easily separated, and the selection wherever possible of materials which are already being widely recycled.

As part of our focus on increasing understanding of design's critical role in delivering sustainable packaging solutions, RPC has also worked with the Ellen McArthur Foundation in the development of a designers' toolkit for the circular economy. This is a freely available website (www.circulardesigninguide.com) with a host of methods and techniques that can be used by designers to ensure they consider the circularity of products.



Complementing the design checklist is RPC's unique grading system that provides an easy visual guide to the sustainability credentials of each new pack. Such a system offers an early indication to brand owners and manufacturers about how their pack specifications may affect its final environmental impact.

RPC'S RECYCLABILITY GRADING TOOL



This enables further discussions and adjustments to be made in order for enhancements and improvements to be incorporated.

The grading system rates each design concept against the Recyclability tool, and uses pictograms similar to those that rate energy efficiency on electric appliances or double glazed windows. Each design has an A to F rating and the coloured bar graph quickly shows the effect of design decisions on its recyclability. Symbols are also included to show if the pack is lightweighted, reusable or made from recycled materials.

For any pack design, there is a crucial balance to be achieved between functionality and sustainability. It has above all to remain fit-for-purpose, because if it cannot deliver on its primary purpose, any environmental benefits are worthless. However, by applying the right skills and knowledge and using the best tools, it is possible to create packs that fulfil consumer, filler, brand owner and recycler needs without compromise. This has to be the best way to achieve a more sustainable future for plastic packaging.



WASTE NOT

The idea that food waste is bad is hardly a new concept – how many of us can remember as children being exhorted to finish everything on our plates?!

Today the problems of food waste receive much greater coverage but the impact of this waste on the environment is still something that many consumers find difficult to grasp fully. We can understand how a carelessly discarded piece of packaging damages our countryside and waterways, but we don't regard wasted food as leaving such a visible and impactful blot on the landscape.

Yet the numbers behind food waste are immense. Around a third of solid waste produced globally each year – some 1.3 billion tonnes – is from food production. In developed countries, where we are already far better equipped to deal with the problem, consumers still waste around 100kg of food each year. (Source: FAO – Food and Agriculture Organisation of the United Nations)



Food waste costs precious other resources. For example, it is estimated that 250km³ of water a year – three times the volume of Lake Geneva – is used to produce wasted foods. Wasted food occupies 1.4 billion km² of land. If this were a country, it would be the second largest in the world. (Source: FAO)

The more food we waste, the more we have to produce – yet already, the 4 billion tonnes of CO₂ emissions from manufacturing food is more than the whole of Germany emits in a year. (Source: FAO)

There are many ways in which we can reduce food waste – better harvesting techniques on the farm, improved production processes in the factory, and cooking only the required amount

WHAT HAPPENS WITHOUT PACKAGING?

We could not purchase liquids, gels, powders or out-of-season fruit. We would have significant problems with food safety and hygiene. Food wastage would increase – this would have negative environmental impacts. Products sold loose have been found to suffer from greater in-store waste, in some cases leading to increases of 20%. Damage and losses would occur to goods in the retail and logistics chain.



in the home – and plastic is one material that can play a key role at many different stages of the supply chain.

Agricultural films, for example, protect crops, and manage light transmission, diffusion and temperature in commercial growing; plastic containers provide safe and hygienic storage for the transport of ingredients and raw materials; and plastic packaging is the ideal solution for keeping foods fresher for longer and protecting them from damage.

Plastic packs are crucial to today's modern lifestyle, responding to changing habits and demands. As we shop less frequently, we need products to last longer. An unpackaged cucumber would be past its best after three days; wrapped in plastic film, it will stay fresh for 14. Opaque but breathable films protect potatoes from light to stop them from turning green too soon. Multilayer barrier technologies prevent oxygen and moisture from reaching many different products. This greatly extends their shelf-lives, as well as enabling them to be transported and stored without the need for energy-consuming refrigeration.

The versatility of plastic is equally critical in being able to create packs for different requirements, such as varying household sizes. Smaller packs and packs that can be split so that only one part needs to be opened at a time provide valuable portion control; resealable and reclosable containers help to preserve contents and enable large sizes to be used over a longer period of time.

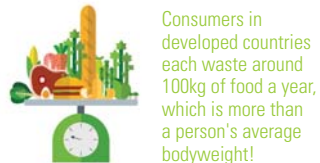


Packs can be designed for easier emptying, such as top-down bottles and dispensers that help to maximise the amount of product that can be accessed. Packs that are easy to open and handle can be used and emptied by as many people as possible, including the less able and children.



As with all global issues, a partnership approach involving governments, businesses and consumers is needed to tackle the problem of food waste most effectively, and as part of this RPC has been a member of the Save Food Initiative (www.save-food.org) since 2013.

Plastic can benefit the entire food supply chain to help reduce the impact of waste on the environment. There is also an arguably even greater need to tackle this problem in a world where there are 805 million people who do not have enough food to eat.



FOOD WASTE IS PREVENTED BY USING PLASTIC PACKAGING*

Bananas in a flexible bag extend their life by **3** DAYS

Plastic bags reduce waste of potatoes by **2/3**

Cucumbers extend their life when wrapped in film to **14** DAYS

Advanced plastic packaging extends the life of steak up to **10** DAYS

*source BPF



A UNIVERSAL APPROACH TO LITTER

The broadcast in the UK of the Blue Planet television programme, accompanied by an increasingly vociferous campaign in the national media, has highlighted the amount of waste plastic in the world's oceans. The vast majority of plastics in the ocean arise from inappropriate disposal or littering on land. These items then find their way into rivers and eventually our oceans.

Litter is a worldwide problem and actions by individual countries on their own are likely to have minimal effect.

The issue of marine litter encapsulates this. Although approximately 80% of marine litter comes from land-based sources, only 2% is actually generated by the USA and Europe, whereas 82% is from Asia, where waste management is less advanced. (Source: www.marinelitterthefacts.com)

Equally true, packaging may currently be the most high profile littered item, but it is by no means the worst offender. The most frequently littered items on land are cigarette ends and chewing gum. In the UK, a Keep Britain Tidy study found that they account for almost 54% of litter.

Litter breeds litter. Whatever is thrown away carelessly is likely to encourage other people to litter as well.

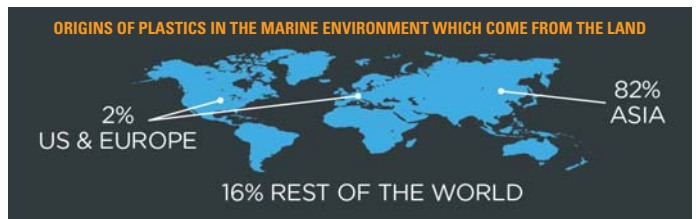
Both these factors underline that the first step in tackling this issue is to realise that it is a man-made problem. Attitudes need to change so that littering is regarded worldwide as totally unacceptable. Fines may act as a deterrent to some but a focus on education should be the starting point to bring through

generations for whom the careless dropping of litter is no longer a way of life.

There are many initiatives that can support this – the availability of more waste bins, for example, is a simple step that can be taken to discourage littering.

Business and industry can play their part. At RPC, as well as the design of products that are resource efficient, and recyclable or reusable, we are also focused on minimising the impact of our manufacturing waste. Several of our sites have achieved or are working towards ensuring zero waste goes to landfill.

We are also a signatory of Operation Clean Sweep, launched by the Plastics Industry Association and supported by trade associations across the globe, which aims to reduce pellet loss



to the environment from plastic conversion operations. Through our membership of external organisations such as INCPEN (The Industry Council for Packaging and the Environment) and the BPF (British Plastics Federation), we are involved in anti-littering campaigns.

Plastics are too valuable a material to be wasted. The plastics industry is committed to reducing the estimated 32% of the material that escapes collection systems globally through littering and poor waste infrastructure – but it is vital that we all recognise the human element inherent in this issue.

WOULD A PLASTIC-FREE AISLE IN SUPERMARKETS HELP REDUCE PLASTIC IN THE OCEAN?

As most (98%) of the plastic that enters the ocean comes from sources outside Europe and the United States, plastic-free aisles here will not contribute in any material way to the problem of plastics in our oceans.

The most important step is to improve the waste management facilities across the world. As over two billion people rely on dumpsites near waterways, this could have a large impact on protecting our oceans.



FIND OUT MORE

For further information on RPC's sustainability positioning and activities, visit www.rpc-group.com/sustainability or if you wish to discuss a particular topic in more detail, please email sustainability@rpc-group.com.

Published by RPC Group Marketing Services, Sapphire House, Crown Way, Rushden, Northamptonshire NN10 6FB, UK
Tel: +44 1933 416528 Email: marketing@rpc-group.com Website: www.rpc-group.com
Written and produced for RPC by Nielsen McAllister PR Limited, Derby, UK

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