

# Environmental Expanded Polystyrene

(EPS) The Environmental Facts



# Environmentally sustainable design with EPS helping the Planet People and Profit.

This brochure provides an overview of environmental data and information relating to the vast range of Expanded Polystyrene (EPS) products in general and information on EPS insulation products specifically as manufactured by Unipod®. It explains how and why EPS insulation provides answers to many of today's environmental concerns and why the use and manufacture of EPS insulation products fits in well with the environmentally sustainable design ethos, incorporating the key aspects of Planet, People and Profit.



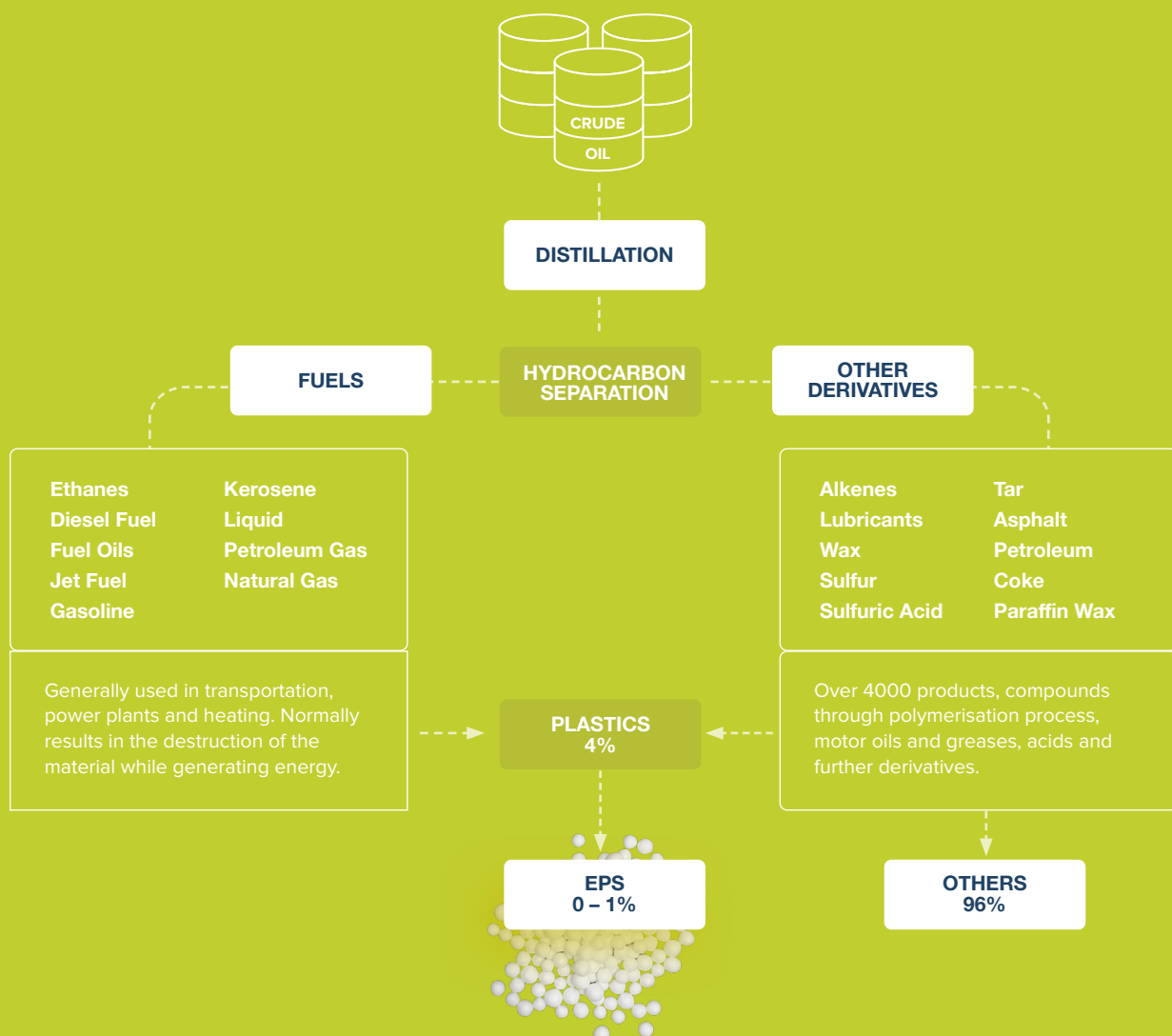


# EPS production; a low pollution process

Expanded Polystyrene (EPS) is made from styrene, a by-product of crude oil extraction and natural starch found in many naturally occurring food products that we consume everyday such as fruit.

For every 1000 liters of crude oil extracted, less than 1kg of EPS

results (less than 0.1%). Importantly, the manufacture of EPS and plastics in general is a by-product of the crude oil refining process as shown below. Crude oil has never been extracted primarily for the purpose of EPS production.



## EPS manufacturing & the environment

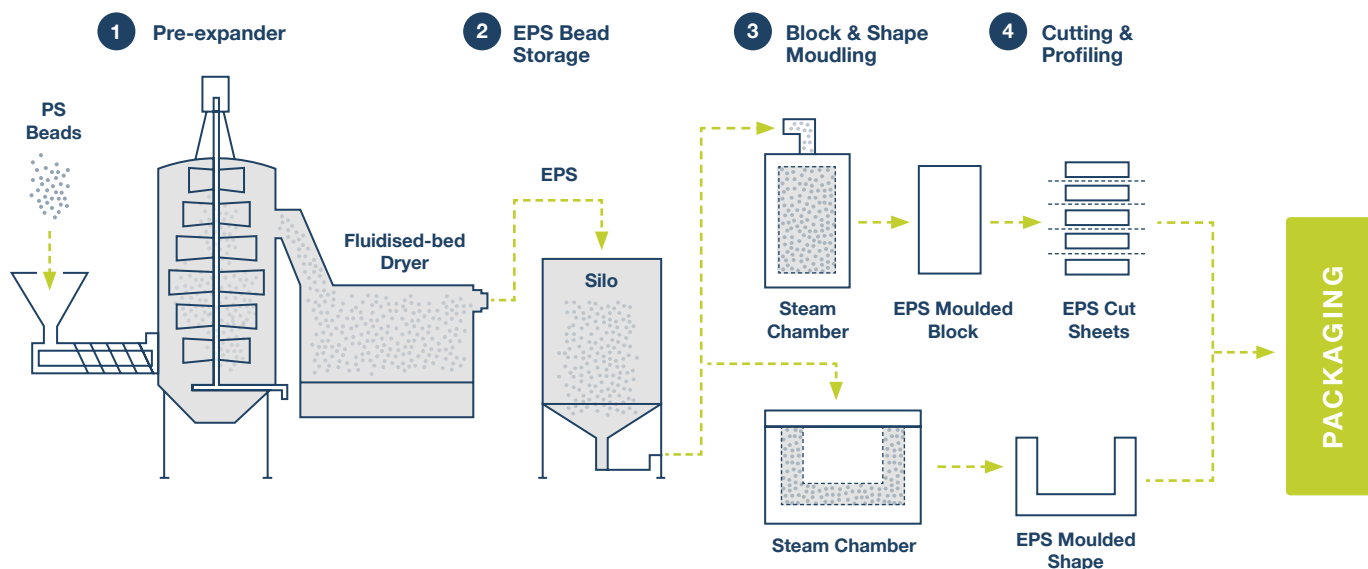
Furthermore, the manufacture of EPS products from the raw material expandable Polystyrene is a low pollution process with steam, produced from natural gas and water, being the principal energy source. The steam consumed in the EPS manufacturing process is then condensed back to liquid water and is reused many times over in the EPS production process.

EPS uses pentane gas as a blowing agent during manufacture. The expanding force in the foam is produced from the pentane blowing agent which is contained within each of the individual expandable polystyrene micro beads. The pentane blowing agent is released during the moulding process.

Pentane has a Green-house gas Global Warming Potential (GWP) of four, as a comparative methane is 28 and R-11 refrigerant is 4660. Pentane also has a zero Ozone Depleting Potential (ODP). Moreover, the European Union does not register pentane as a substance that is hazardous to human health or the environment.

Since the blowing agent is rapidly replaced by air, installed EPS insulation does not experience any significant off-gassing of pentane or other substances that may affect indoor air quality. Importantly EPS insulation products as manufactured by Unipod® do not contain the ozone depleting substances (CFCs, HCFCs or HFCs) and none are consumed in the products manufacture.

## Production and conversion of EPS insulation products creates a net Green House Gas benefit





## Environmental efficiency of EPS & its positive carbon footprint – Building & construction

It has been proven that over the life cycle of Expanded Polystyrene (EPS), the product has a net positive impact on our environment. Like all man-made materials, the manufacture of EPS products will have some impact on the environment however, as it is impossible to make something out of nothing. All manufactured products require the use of some form of energy to be created, most of which is currently derived from the combustion of fossil fuels. EPS uses fossil fuels in the form of refined crude oil and natural gas in the production of the polystyrene resin and its pentane blowing agent, as well as for processing, finishing and transportation required for manufacture and delivery of the finished product.

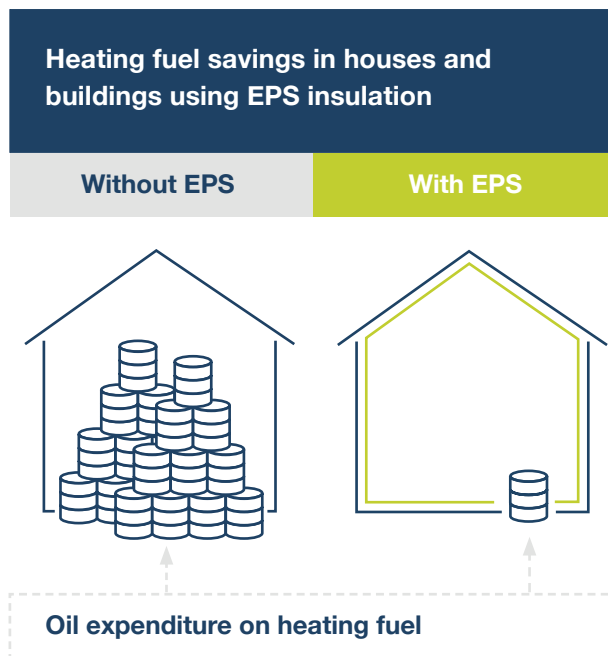
Having stated the above, when viewed from a product life cycle, cradle to cradle or cradle to grave perspective however, the use of EPS products actually generate a beneficial positive carbon footprint as the use of EPS insulation products saves considerably more energy, than is consumed during its manufacture, use and disposal.

As a packaging or insulating material, EPS is more environmentally friendly and efficient when compared to many other insulating products in terms of the embodied energy consumed to manufacture it, the energy consumed to transport it and the emissions released over the entire life-cycle of the product, including its end of life disposal.

Where EPS is used to insulate buildings (be it as wall, floor or roof insulation), it generates a positive carbon footprint. As an example, the energy saved over the lifetime of a typical residential housing construction clad with an EPS External Insulated finishing system (EIFS), in reduced heating and cooling demand, more than compensates for the raw material and energy consumed in its production, application and disposal, saving far more in CO<sub>2</sub> emissions than it generates, during its manufacture, use and disposal.

Depending on the building design and the climatic conditions, the effective application of EPS insulation can cut carbon dioxide emissions by up to 50%. The energy used in the EPS products manufacture, may be recovered within six months or less by the energy saved in the buildings in the reduced heating or cooling demand, when EPS is used to insulate the building.

Furthermore, as the insulation performance of EPS does not deteriorate over time, it continues to reduce the energy requirement, fossil fuel dependence and energy related emissions of a building over its full operational lifespan. The energy efficiency of EPS insulation is such that for every kilogram of oil used during its manufacture, the equivalent of over 100 kilograms of crude oil will be saved in the reduced heating and cooling demand, over the lifetime of a building.



*1kg of oil in manufacture saves the equivalent of over 100kg of oil over a life time of a building.*





EPS comprises

98%

air making it a highly  
efficient material

## Energy efficiency in buildings

The use and application of EPS insulation in buildings directly benefits the three pillars of sustainability: Planet, People and Profit. The use of EPS has a demonstrated a marked advantage in terms of cost-effectiveness and long-term performance.

Well insulated buildings not only help preserve the environment for subsequent generations, they also allow for more comfortable living conditions for the people using them and provide a strong economic benefit to the individual and the community.

The exceptional performance of EPS as an insulator for the built environment offers the building construction industry the tools and technology needed to achieve superior thermal performance while making a significant and restorative contribution to the reduction of global warming.

Unipod® is committed to the responsible use of EPS insulation and the promotion of its superior environmental qualities to lower house-hold energy requirements and its overall impact on the environment.



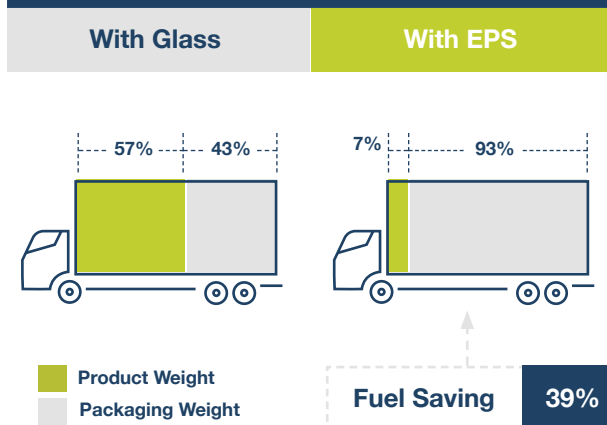
## EPS in our daily lives

From preserving fresh food and insulating buildings to the manufacture of crash resistant safety products and transportation of temperature sensitive fresh produce and medications, EPS plays a vital role in all our daily lives.

The environmental footprint of EPS captured over its entire lifetime is substantially less than that for comparable materials. Combined with its exceptional economic, durable, protective and insulating properties, EPS makes a positive contribution to the environment as well as to the efficiency and performance of the businesses that use it.



### Using EPS as packaging compared to glass and the transport savings



## EPS packaging

Common packaging products such as wood, corrugated cardboard and paper require up to twice the amount of energy to produce, resulting in up to 60% more waste generation by volume. These packaging materials also weigh up to six and a half times as much as EPS.

Comprising 98% air, EPS is one of the most resource efficient materials in the world. The use of lightweight EPS packaging results in reduced fuel consumption and a significant reduction in vehicle CO2 emissions compared to other denser and heavier packaging materials such as cardboard and wood.

Using EPS to package a product will result in a reduction in fuel consumption as compared to some other heavier packaging materials. Supply chain wastage and consumption of additional energy, material and transportation resources are also minimised by the use of EPS packaging as it greatly assists in reducing the number of goods broken or damaged in transit. In the food industry, EPS packaging keeps produce fresh and at the correct temperature for longer, helping to reduce spoilage and minimise waste, which in turn reduces the generation of methane gas, which is a more potent and destructive greenhouse gas than CO2.



## EPS product life cycle comparison

A product life cycle analysis is a process that quantifies the total impact of a given product during its production, distribution, use and recycling, treatment and / or disposal (cradle to grave).

A reliable life cycle analysis will measure the total energy consumption, water consumption, air pollution, water pollution, global warming potential and the volume of solid waste generated by the production and consumption of the production in question from cradle to grave.

### Life cycle analysis

Disposable Cups*	EPS Cup	Paper Cup
Chemicals	1	15
Electricity	1	13
Cooling water	1	1.3
Process water	1	170
Steam	1	6
Crude petroleum	1	0.6

Shape/Moulded Pack*	EPS	Pulp & Fibreboard
Energy consumption	1	2.3 – 3.8
Air pollution	1	3.1 – 4.1
Water pollution	1	2.3 – 2.8
Global warming potential	1	4.0 – 4.4
Volume of solid waste	1	0.69 – 0.79

Packaging Material*	EPS	Wood, Paper. etc
Cost	1	1.3
Weight	1	6.4
Energy consumption	1	2.0
Volume of solid waste	1	1.2

*The tables above compares the life cycle analysis information pertaining to a disposable cup made from EPS as compared to some other common materials such as paper.*

## A simple comparison

Disposable paper drinking cups are often compared favorably with EPS cups on environmental grounds. This could not be further from the truth, with EPS being far more resource and energy efficient.

### Paper Coffee Cup vs EPS Coffee Cup



Manufacture of a paper coffee cup consumes:

- 170 times as much process water
- 30% more cooling water
- 15 times the amount of chemicals
- 13 times more electricity
- 6 times as much steam

As can be seen by the information presented above, contrary to popular belief, the humble paper coffee cup, which is touted as being environmentally sustainable, actually requires far more energy and resources to produce than an equivalent coffee cup made from EPS.

Furthermore, EPS actually provides far superior thermal insulation compared to paper, ensuring that the coffee that people love, stays hotter for longer.





# The environmental facts about EPS



## Fact

Comprising approximately 98% air, EPS is one of the most resource efficient materials on the planet. Use of lightweight EPS packaging results in reduced fuel consumption and a significant reduction in vehicle CO<sub>2</sub> emissions compared to the transportation of products using other heavier packaging materials such as cardboard and wood.



## Fact

Supply chain wastage and consumption of additional energy, material and transportation resources is also minimised by the use of EPS packaging, as it reduces the number of goods that arrive in a broken or damaged state whilst in transit.



## Fact

EPS packaging also keeps produce fresh and at the correct temperature for longer, helping to reduce spoilage and minimise waste, which in turn reduces the generation of methane gas, a more potent greenhouse gas than CO<sub>2</sub>.



## Fact

In building insulation, EPS has a positive impact on the environment due to the reduction in heating and cooling requirements of a building insulated with EPS. During the lifetime of a building structure, EPS insulation can save over 200 times the equivalent energy used to manufacture it.

# Ecologically sound reuse of EPS products



## EPS recycling & raw material management

Recycling saves money, energy and significantly reduces the impact of a given product on the environment. Again, contrary to popular belief, EPS is 100% recyclable and is one of the most easily recycled of all the insulating materials used in building and construction and aligns with the "cradle to cradle (C2C)" principle.

Unipod® has heavily invested in EPS recycling equipment and recycles all its own EPS off cuts for reuse. Unipod® also collects clean EPS waste from Waffle Pod users as well as recycling a range of EPS items from commercial recyclers who separate EPS from other waste streams. These products are recycled by Unipod® and the recycleate is then reused in the manufacture of other Unipod® EPS products.

Even the EPS dust that is generated from the Unipod® EPS recycling process, is collected, compacted and sold as a raw material feed stock to companies that manufacture items such as replacement hardwood decking, garden furniture, picture frames and coat hangers. EPS waste can also be mixed with concrete to produce building products such as prefabricated light weight concrete blocks. The manufacture of these products uses 100's of tonnes of recycled EPS material each year.

Unipod® also uses integrated chain management principles in the manufacture of its EPS products. This includes manufacturing EPS products in optimum shapes and sizes for minimal use of raw material, reuse of cut-offs during production and inclusion of post-consumer waste EPS. Unipod® continues to promote the use of recycled polystyrene in a wide variety of end use applications.

For more recycling information, contact the Unipod® sales office. Refer to the back page of this brochure for contact details.

The recycling of EPS material by Unipod®, helps to positively manage the end of life outcomes of EPS manufactured products. Similarly, Unipod is also highly focused on achieving positive outcomes at the front end of EPS product manufacture and the minimisation /elimination of EPS raw material waste, from within its manufacturing process. Due to the very small and lightweight nature of individual EPS beads, the material handling and control of the raw material during manufacture is paramount in ensuring that none of the material inadvertently escapes into the external atmosphere, where it can end up in our water ways.

Unipod® being the only ISO 9001 Quality assured EPS product manufacturer in Australia, also prides itself on being an environmentally responsible corporate citizen, maintaining some of the strictest material handling protocols within the Australian EPS industry. Our independently audited work procedures and practices, ensure that all aspects of raw material handling and processing are undertaken in a highly controlled manner, resulting in the near zero volume release of any raw EPS material escaping out into the external environment.

Therefore, whatever your packaging or insulation requirement, you can be sure that with Unipod® EPS, you are making the right choice for your business and for the environment.



## References

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## Unipod®

Governments, environmental advocacy groups and consumers in general, are increasingly demanding the development and manufacture of products and materials that are proven to be eco-friendly. Unipod® is committed to the ongoing and responsible use and manufacture of EPS products and the promotion of the materials superior environmental qualities in assisting to lower energy consumption requirements, greatly reducing the negative impact on the environment that this has.

Unipod® proudly manufactures all its eco-friendly EPS products right here in Australia, using some of the world's largest and most technically advanced EPS block moulding machinery. Some of the EPS products that Unipod® responsibly manufactures includes:

- Unibloc Geofoam®
- Unitherm® Underslab Insulation
- Unipod® Waffle Pods
- Unipoly® EPS Block / Panel
- Marine Pontoons
- Profile cutting
- Unipod® EPS Recycling

Unipod® is a progressive moulded polystyrene manufacturing and recycling company, founded in 2007, in Victoria Australia. The plant's machinery and equipment are custom designed and built, making the plant a state-of-the-art operation, and Unipod® the market leader in product quality, design flexibility and overall service.

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