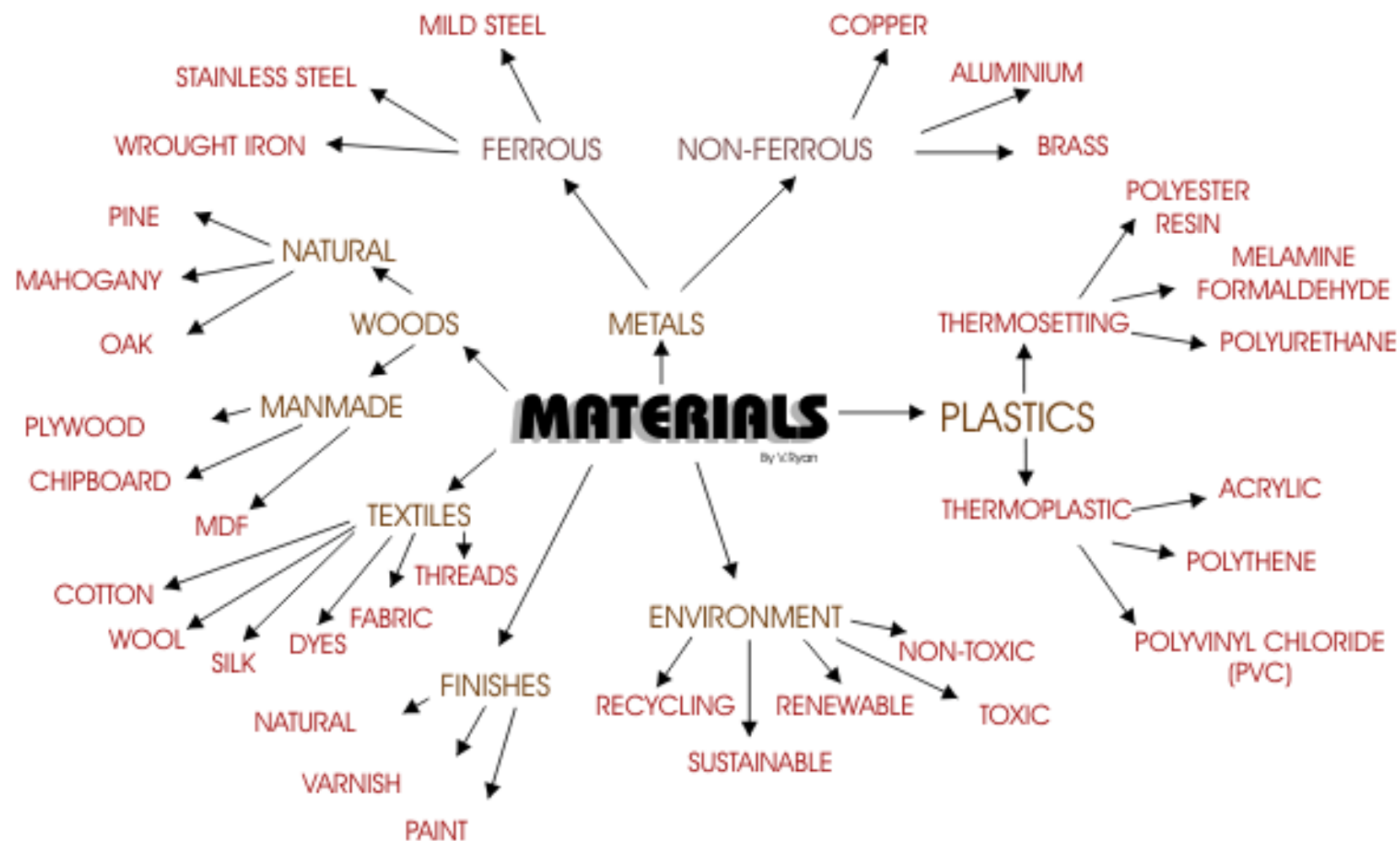


Is all plastic bad for the environment?

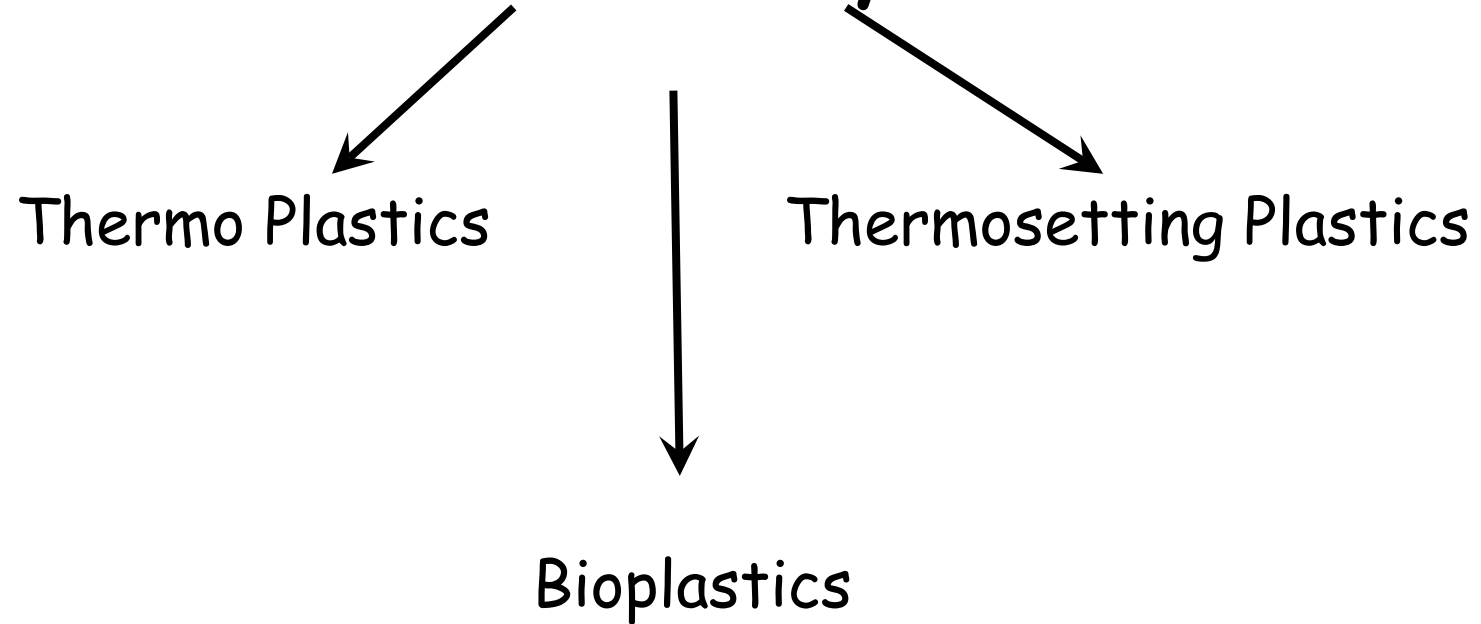
Materials Theory

Plastics

KEY ASPECTS OF MATERIALS RESEARCH



Plastics/Polymers



Thermo plastics

THESE PLASTICS CAN BE RE-HEATED AND RE-SHAPED IN VARIOUS WAYS. THEY BECOME MOULDABLE AFTER REHEATING AS THEY DO NOT UNDERGO SIGNIFICANT CHEMICAL CHANGE. REHEATING AND SHAPING CAN BE REPEATED. THE BOND BETWEEN THE MOLECULES IS WEAK AND BECOMES WEAKER WHEN REHEATED, ALLOWING RESHAPING. THESE TYPES OF PLASTICS CAN BE RECYCLED.

Thermosetting plastics

THESE ARE PLASTICS THAT ONCE HEATED AND MOULDED, CANNOT BE REHEATED AND REMOULDED. THE MOLECULES OF THESE PLASTICS ARE CROSS LINKED IN THREE DIMENSIONS AND THIS IS WHY THEY CANNOT BE RESHAPED OR RECYCLED. THE BOND BETWEEN THE MOLECULES IS VERY STRONG.

Thermo plastics

Thermo plastics can be heated and shaped over and over again

Thermosetting plastics

Thermosetting plastics can only be heated and set once

So why make Thermosetting plastics?

How are plastics made?

Oil refineries 'refine' oil in massive quantities, to produce the fuels we need. These include diesel, petrol and heating oil. However, some of the raw materials we need to manufacture plastics, are also extracted from oil at the refinery. When crude oil is refined, four percent ends up as raw materials for the production of plastics.

1. Complete the following paragraph, by adding the missing words:

Oil is used widely for the production of _____ as it is composed of _____ and hydrogen. This is why oil is called a _____. Oil and natural gas are the most important raw materials for plastics manufacture. To the plastics industry, _____ is the most important _____ distilled from crude oil. It is used in the production of a range of plastics.

PLASTICS

HYDROCARBON

NAPHTHA

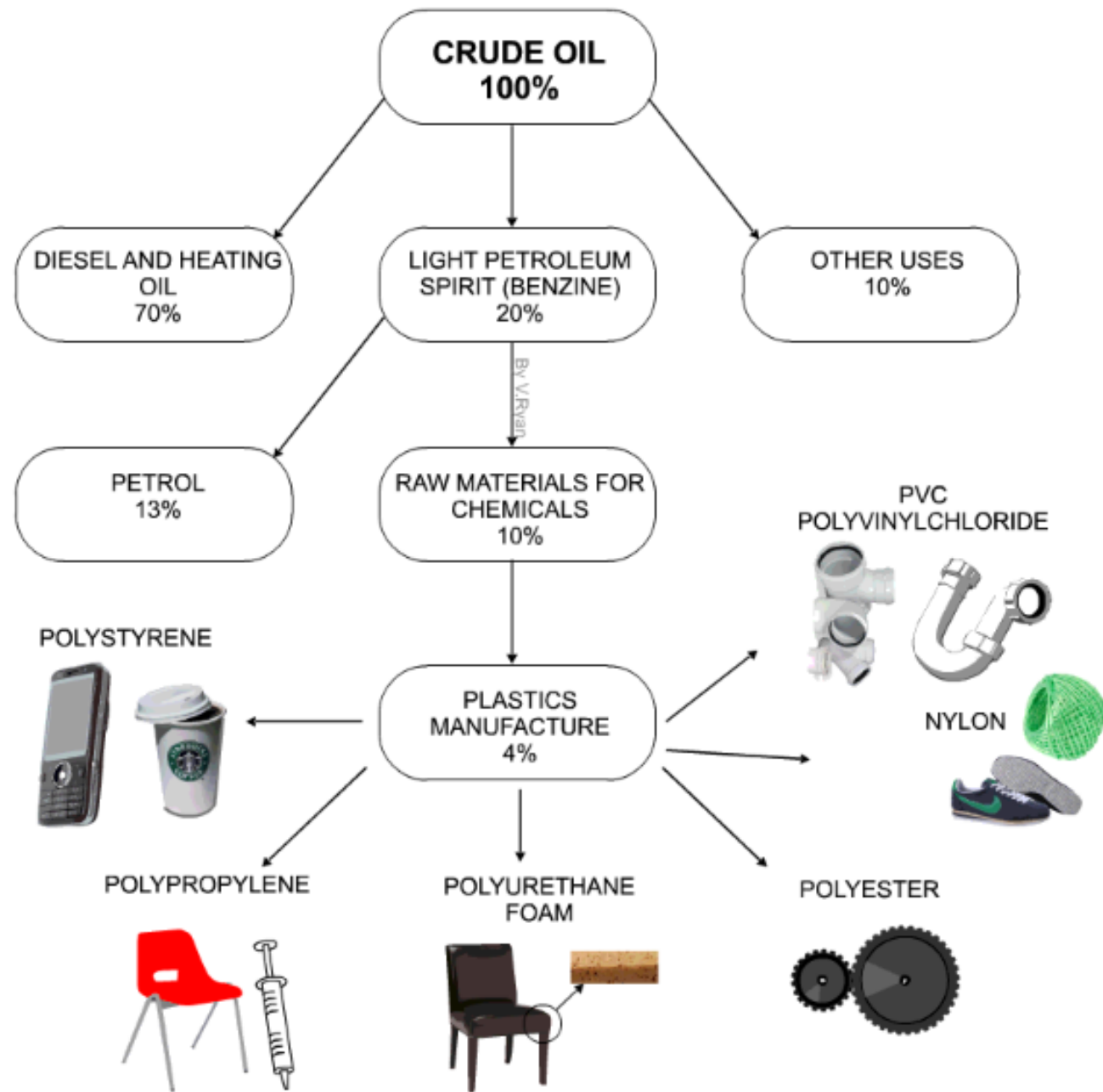
CARBON

FRACTION

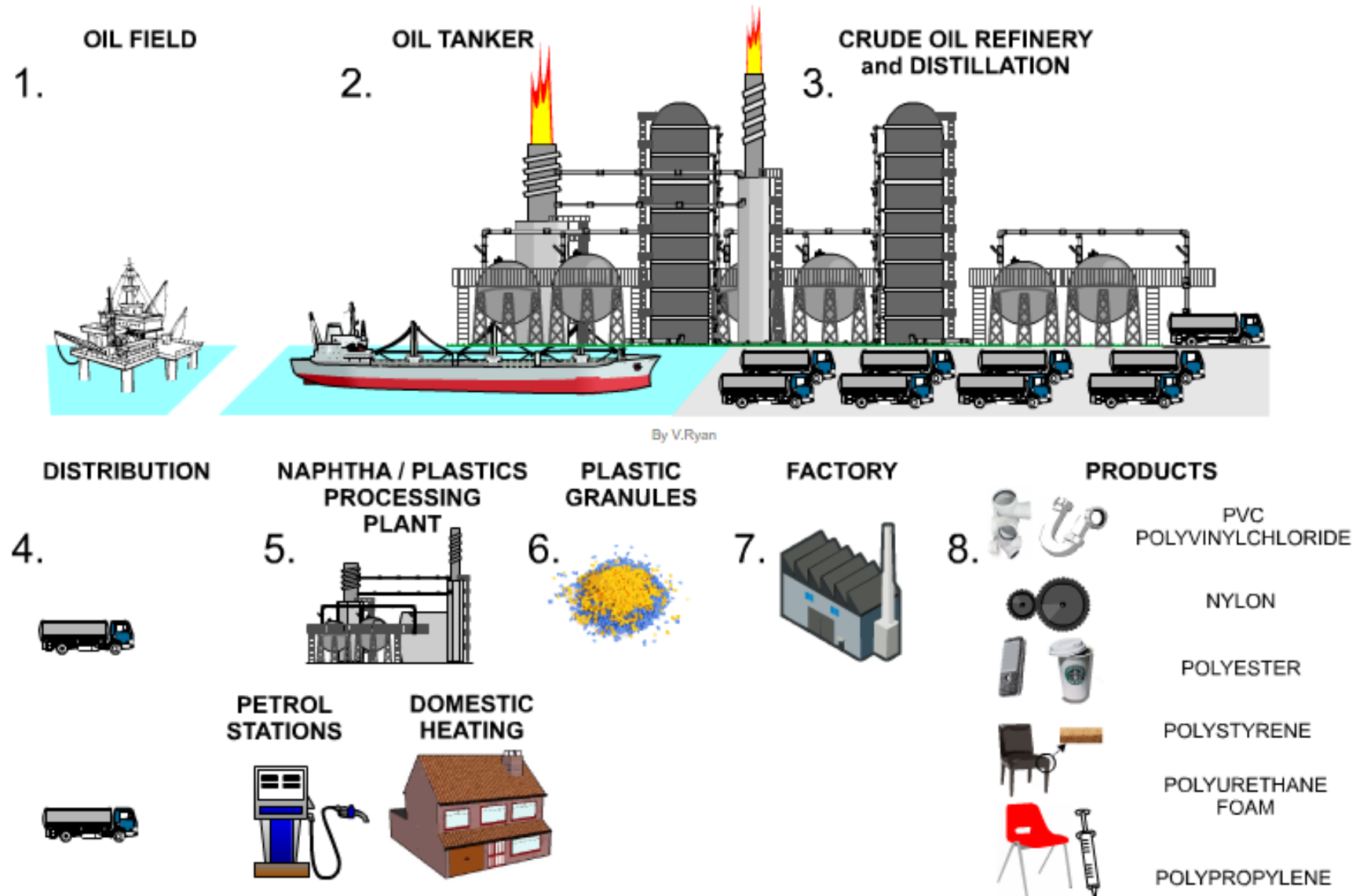
How are plastics made?

Oil refineries 'refine' oil in massive quantities, to produce the fuels we need. These include diesel, petrol and heating oil. However, some of the raw materials we need to manufacture plastics, are also extracted from oil at the refinery. When crude oil is refined, four percent ends up as raw materials for the production of plastics

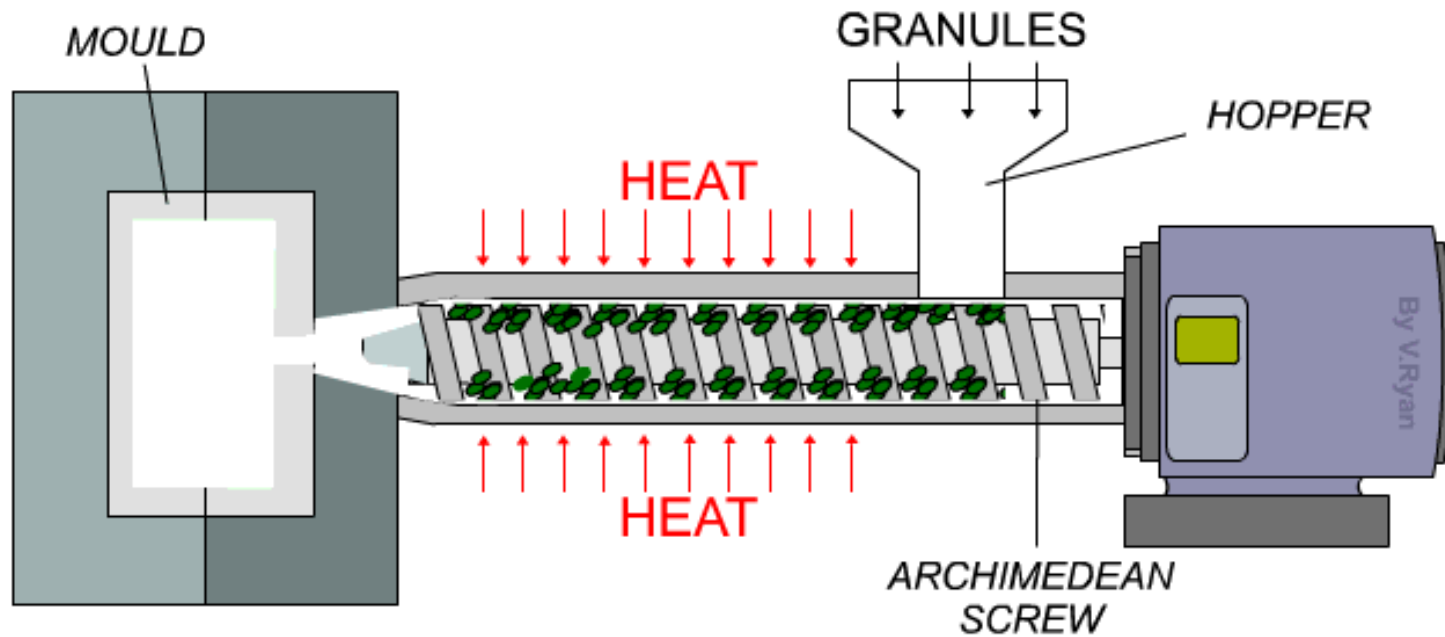
Oil is used widely for the production of plastics as it is composed of carbon and hydrogen. This is why oil is called a hydrocarbon. Oil and natural gas are the most important raw materials for plastics manufacture. To the plastics industry, Naphtha is the most important fraction distilled from crude oil. It is used in the production of a range of plastics.



The diagram below outlines the processing of crude oil and its subsequent use as fuels, oils, gases and plastic products.



Injection moulding



1. GRANULES OF POLYPROPYLENE ARE ADDED TO THE HOPPER.
2. THE GRANULES FALL ON TO THE ARCHIMEDEAN SCREW WHICH PUSHES THEM THROUGH THE HEATER.
3. THE GRANULES MELT AND BECOME MOULDABLE.
4. AS THE MOLTEN POLYPROPYLENE IS FORCED INTO THE MOULD, A 'JET' OF COMPRESSED AIR FORCES IT TO THE OUTSIDE WALL OF THE MOULD, FORMING THE BODY OF THE CONTAINER.
5. WHEN THE POLYPROPYLENE COOLS, IT CAN BE REMOVED FROM THE MOULD.

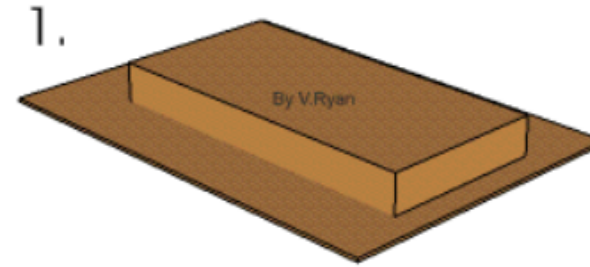
Vacuum forming

The first stage of vacuum forming is to manufacture a precise mould. This is a skilled job as any imperfections to the mould will show up every time it is used to shape plastic such as high density polystyrene. Bubble wrap is no exception.

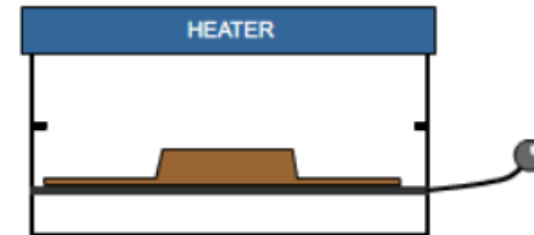
The mould can be used hundreds and even thousands of times to produce the same plastic part. Each part will be exactly the same.

The mould is placed in the vacuum former. It is placed centrally.

A sheet of high density polystyrene is paced above the mould and clamped in position. Various thicknesses are available. Usually material 1mm thick is the most suitable for this type of vacuum forming.

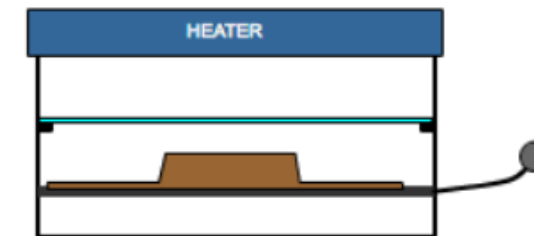


2.



THE MOULD IS PLACED IN
THE VACUUM FORMER

3.



PLASTIC SHEET IS PLACED ABOVE
THE MOULD AND CLAMPED
SECURELY.

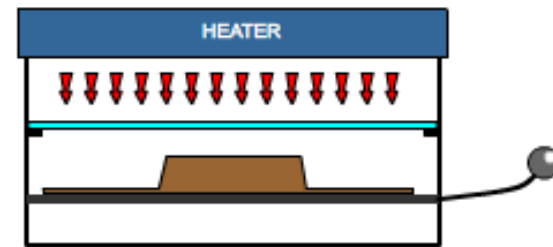
The heater is turned on. When the machine is being used from 'cold' it takes approximately five to ten minutes to warm up to the temperature needed to heat the polystyrene sufficiently.

Once warm, polystyrene of this type takes only four or five minutes to heat up before vacuum forming can begin.

The plastic (polystyrene) becomes pliable and flexible after a short time. It must be very flexible before it can be formed properly.

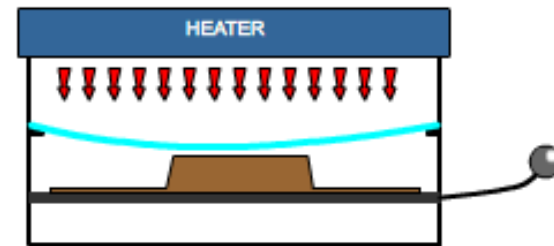
When the polystyrene is ready the shelf is then lifted up towards the polystyrene sheet. The air underneath the former is pumped out and the polystyrene takes the form of the mould.

4.



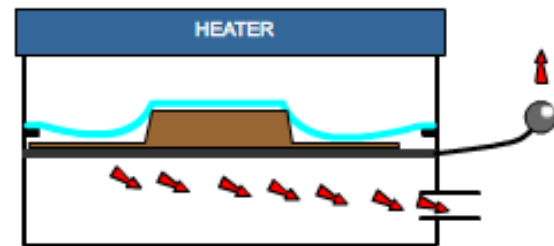
THE ELECTRIC HEATER IS TURNED ON
TO WARM THE PLASTIC SHEET.

5.



THE PLASTIC BECOMES FLEXIBLE
WHEN HEATED

6.



THE AIR IS PUMPED OUT OF
THE AREA BELOW THE PLASTIC
AND MOULD.