

Vacuum Forming a Snack Tray for an Airline

The drawing shows a basic design for a plastic snack tray that will be used by an airline on flights of between 2-3 hours duration.

The tray will hold a snack consisting of 3 parts:

- The main meal (*a sandwich or small cold meal or small hot meal*)
- a cupcake
- a cup of orange juice.

The drawing shows a tray with two compartments but it should have three.



Design Brief

Design and make a prototype plastic snack tray that will hold a snack consisting of a main meal, a cupcake and an orange drink.

Specification

The tray must be made from a sustainable plastic material that can be washed and re-used. It must be as light as possible, yet be rigid enough to hold the snack without bending or twisting. One compartment must be the correct size for a standard cupcake foil or paper case. One compartment must be the correct size for a standard sized plastic cup.

Industrial Production Requirements

You should describe at least two plastic forming processes that could be used to manufacture the snack tray in large numbers.

Presentation Requirements

- You should show at least 5 tray designs using notes and sketches to illustrate your ideas.
- You should make a coloured presentation drawing of your preferred design, using isometric or two point perspective drawing techniques.
- You should also make a dimensioned orthographic drawing of the tray, the foil or paper case and your chosen type of plastic cup.

Planning for Making

You should describe the stages in manufacturing the snack tray.

Additional information

- You must state whether the plastic cup will be a disposable component or a re-usable component
- you should state what the main meal should consist of
- you should describe the main ingredients of three different flavoured cupcakes
- you should describe the advantages and disadvantages of using plastics made from renewable materials
- you should describe the advantages and disadvantages of using plastics that are made from fossil fuels.

Prototype

A prototype is a finished, working product that is still at the testing and evaluation stage. It is the first one of a series that is likely to be reproduced in large numbers.

Sustainable Plastics

Sustainable plastics are made from renewable sources such as wheat, corn, potatoes, grass and palm fibre. They are biodegradable so discarded products do not have a long term effect on the environment. Sustainable plastics can be composted as they are biodegradable.

On the other hand, plastics made from fossil fuels are nonbiodegradable. Oil, the raw material from which most plastics are made, is non renewable. Discarded or dumped waste plastics have a catastrophic and long term effect on the environment, on land and in the sea.

Assignment Objectives

Students will develop their D&T capability by designing and making an original product of good quality that satisfies the requirements of the design brief.

By the end of the assignment, students will know that:

- shapes can be formed by vacuum forming
- thermoplastics soften and may be bent when heated
- thermoplastics remain bent / deformed after cooling
- a vacuum former is used to heat whole sheets of thermoplastic (cut to match the size of the vacuum former)
- a vacuum former is used to draw a heated thermoplastic sheet around a pattern
- patterns for vacuum forming may be made from resistant materials and/or clay
- patterns made from resistant materials should be chamfered to allow the formed plastic sheet to be removed
- there are advantages and disadvantages of using plastics made from renewable materials
- there are advantages and disadvantages of using plastics that are made from fossil fuels
- hot parts of strip heaters and heated plastics will burn skin so:
 - risk assessments of the hazards should be carried out
 - safe working practices should be adopted.

Success criteria

Each student:

- has designed and made an original product that satisfies the given design brief and specification
- has used tools safely and has strived to achieve quality in marking out, cutting, shaping, finishing and joining their chosen materials
- knows that thermoplastics can be softened by heating and become rigid again when cooled
- knows that a heated and softened sheet of thermoplastic may be drawn around a pattern using a vacuum former
- knows that patterns should be chamfered and corners should be rounded slightly
- has made a pattern independently
- has used a vacuum former independently
- has assessed the risks associated with working with strip heaters and hot thermoplastics and has worked safely throughout the assignment
- is able to describe the main advantages and disadvantages of using plastics made from renewable materials and fossil fuels
- shows evidence of having evaluated his/her work.