

A2 LEVEL Section C

FACT FILES

Technology & Design

For first teaching from September 2011

For first award in Summer 2013

Design for  
Manufacture



tech  
nology  
and  
design



### Learning Outcomes

#### Students should be able to:

- Formulate proposals for product design and development taking into account of the need for scale production.
- Design to minimise materials, components, processes and the environmental impact.
- Design to minimise packaging material and wasted packaging space.



### Course Content

#### Formulating proposals for product design and development taking into account scale of production:

As a greater variety of materials and range of manufacturing processes become available to designers, so does the opportunity to create products which are not only more economical to produce but also more sustainable. Manufacturing products has an impact on the environment from sourcing the raw materials to the export and delivery of the product to the end user. As raw materials become less readily available and the pressure on manufacturers to reduce their carbon footprint increases, so designers have developed strategies to design for sustainability.

#### Reduce Materials:

This IKEA stool is very lightweight and is made from only one material. It's simple design allows it to be used in a range of different ways, which makes it more useful for the user. Both manufacturers and the environment benefit when a single material is used to make a complete product. By reducing materials, both manufacturing and material costs reduce. Less materials also makes it much easier to

#### Permission Needed



recycle a product at the end of a product's life, as well as reducing its impact on the environment.



#### Suitable Manufacturing:

Designers need to consider the volume of production carefully, if a product is to be manufactured in small batches then selecting a suitable manufacturing process is important if profits are to be made. For instance could the product be made from a less complex mould or less energy intensive process or could the product be powder coated rather than the more wasteful spray painting process? By considering the volume and the types of manufacturing processes energy can be saved from the overall production process.

#### Avoid Harmful Chemicals:

In the past, material selection might not have considered what happened to the product at the end of its useful life. Nowadays though with the importance of recycling, manufacturers have to demonstrate a responsibility to their consumers and the environment. With many products ending up on rubbish tips, plastics like PVC, polystyrene, formaldehyde (like some MDF's) or lead and mercury can have a long term effect if left lying landfill sites. Recycling them can also be time consuming and expensive and the waste produced during recycling can be difficult to dispose of. Manufacturers now try use alternative environmentally friendly materials such as HDPE, aluminium or bio degradable plastics.

#### Reduce Components and Fixings:

Better manufacturing methods allow designers to design products which have parts that snap together rather than use additional components like screws. By using methods like this the cost of the components are eliminated and the time taken to manufacture the product are greatly reduced, thereby saving money. Using simpler construction methods with fewer fasteners will make it easier to disassemble and recycle.

If components are essential to the design they should still be used to ensure a successful product. If they can be made from the same material as the rest of the product then recycling will be much easier.

### Design to minimise Environmental Impact:

All products have an effect on the environment from the moment they are created until they are either recycled or thrown out. Reducing the carbon footprint of a product can be done in various ways:

1. Use recycled materials for part or all of the products materials.
2. Manufacture the product in a country where it will be sold, rather than using long distance shipping which will produce Co2.
3. Employ engineers whose job it is to monitor environmental impact during the products manufacture, use and potential recyclability.
4. Reduce or completely remove all harmful chemicals from the materials list, thereby improving recycling.
5. Reduce the size and weight of packaging to reduce the amount of harmful emissions occurring during transport to the market place.

A good example of a product making good use of recycling is The Green Toy company. This company use the High density polyethylene plastic (HDPE) from plastic milk containers as the main material in their toys. These toys are then packaged in recycled card with no extra plastic wrappings or ties, making them easier to recycle as well.



Companies which manufacture electronic goods pay careful attention to the energy required to power their products, selecting components which are energy efficient and designing software to make them work more efficiently e.g. standby modes or automatically reducing the backlighting on LCD screens.

## Design to minimise packaging material and wasted space

Products, particularly electrical goods, used to come in large heavily padded boxes, with a lot of white expanded polystyrene to protect the goods inside. In more recent years manufacturers take the time to design packaging which has less of an impact on the environment. Some of the ways manufacturers reduce packaging and wasted space are:



1. Use recycled materials for the actual packaging, this has the benefit of not having to source cardboard from raw sources, reducing the demand for more timber.
2. Use lighter weight materials for the secondary packaging (which would be used on the store shelves) and use heavier more robust materials for the main transit packaging.
3. Remove the need for extra materials such as tapes and adhesives e.g. use low melt glue if adhesive is required.
4. Design packaging which can withstand several reuses thereby saving on costs as well the environment.
5. Designing the packaging so that 'voidspaces' are minimised therefore reducing the need for extra fillers to prevent the product rolling about inside a large box.
6. Use air bags for packing rather than heavier polystyrene.



## Revision questions

1. Food packaging can have a negative impact upon the environment. Explain how this can be minimised? [4]
2. Describe **two** ways a designer can design a product to be less harmful to the environment. [2]
3. Explain **two** benefits a manufacturer may have when they reduce the amount of packaging for their products? [2]

