We all have a responsibility to protect the environment. We are required to modify and organise our work activities in such a way to comply with current environmental laws and legislation, and to meet our moral and social obligations regarding sustainability. This means considering work activities in detail and exploring methods to reduce the negative and increase the positive impacts of these activities on the environment. This becomes even more important when working with hazardous materials.

This topic guide will cover:
- planning work activities to reduce the negative impact on the environment
- organising work activities to comply with the legal and organisational policies relating to the environment
- meeting legal and company procedures and guidelines relating to handling, storage and disposal of hazardous materials.

**Links**
- NVQ Unit 1: Ensure compliance with legal, regulatory, ethical and social requirements.
- NVQ Unit 34: Plan and manage a project.
1 Reducing negative impacts of manufacturing engineering activities

It is very important to realise that most manufacturing activities have a direct or indirect impact on the environment. In some cases this impact is very minimal (for example, when your task is to prepare a sub-assembly to be included in the main product using electrical tools) but if we add all these small impacts together across the globe, the effect can be substantial. Therefore it is important that, as an engineer, you:

- consider your activities at work fully
- identify the potential impact on the environment
- try to modify or apply changes in order to reduce any negative impact
- initiate a positive impact on the environment wherever possible.

You need to ensure that activities are also efficient, effective and comply with legal requirements and environmental policies. This is particularly important if you are dealing with hazardous materials.

Responsible organisations and individuals should be fully committed to minimising any negative impact of their activities and improving their environmental performance. Although the procedures and methods used depend to a large extent on the nature of the activities, some general guidelines are outlined below.

- Reduce the use of different resources such as gas, electricity, water and raw materials.
- Use environmentally friendly forms of transport where possible, such as car sharing, walking, cycling, use of public transport or allowing staff to work from home.
- Maximise the use of alternative green or sustainable energy (such as solar or wind energy) and resources (easily reusable or recyclable products such as paper or glass).
- Reduce and minimise the use of hazardous materials and ensure that a safe and reliable handling and disposal process is in place.
- Minimise all types of industrial and non-industrial waste.
- Maximise reuse and recycling (this applies to manufacturing and office activities).
- Effectively communicate your commitment to the protection of the environment to suppliers and incorporate the organisational policies on the environment as part of the procurement process.

2 Organisation environmental policies

Having an environmental policy, statement or vision is an important step towards an organisation proving its commitment to fulfil its environmental obligations. The policy should be reviewed and updated periodically to ensure compliance with recent legislation and policies. It is a good idea to have some quantitative targets included in this policy, for example reducing energy consumption or increasing the use of recycled resources and materials by a certain percentage over a period of time. Some examples of environmental policies for manufacturing organisations are given on the next page.
**Bandvulc**

Bandvulc is a tyre manufacturing company. Below is an extract from its environmental policy which can be found at:

[www.bandvulc.com/EnvironmentalPolicy.aspx](http://www.bandvulc.com/EnvironmentalPolicy.aspx)

‘We will comply with the spirit, as well as the letter, of environmental legislation and approved codes of practice and will co-operate fully and maintain open relationships with all regulatory authorities.

We will foster an understanding of the environmental issues arising from our business activities amongst our employees, suppliers, contractors, customers and also within the local community.’

In this policy the company has made a commitment to involve employees and other stakeholders in their efforts to reduce the environmental impact of their activities. This is very important and, as the analysis of product life cycles in Topic guide 35.4 shows, sometimes the main impact is outside the manufacturer’s physical location. The reference to local community is also important, demonstrating an awareness of the possible impact of manufacturing activities on the wider area. Examples of these impacts are noise, traffic and various types of emissions.

**TDK**

The environmental policy of TDK, an international manufacturer of electronic products, has set itself specific numerical targets as part of the TDK Environmental Charter. The full charter can be found at: [www.global.tdk.com/csr/environmental_responsibility](http://www.global.tdk.com/csr/environmental_responsibility).

TDK aims to achieve what has been stated as carbon neutrality by the end of financial year 2021.

Carbon neutrality has been defined as:

‘CO₂ emissions (environmental load) due to manufacturer operations – (minus) reduction of CO₂ emissions through products (environmental contributions) ≤ zero’

**Sony**

Sony, an international manufacturer of electrical appliances, is using an environmental management system to reduce the impact of its manufacturing activities. It has set a target of zero environmental footprint by 2050. In order to achieve this target Sony has grouped its environmental activities and attention into four different categories:

a  curbing climate change by moving towards products with zero emission, using renewable energies and reducing energy consumption

b  conserving resources by eliminating the use of virgin materials, promoting recycling and reuse, minimising waste and promoting efficient use of water

c  controlling hazardous substances through careful management of these materials, reducing their use and substituting them with environmentally friendly materials
d promoting biodiversity by respecting the natural environment and promoting maintenance.

In order to achieve the target of zero environmental footprint by 2050, Sony has set the following mid-term targets as shown in Table 35.5.1.

<table>
<thead>
<tr>
<th>Climate change</th>
<th>Resources</th>
<th>Chemical substances</th>
</tr>
</thead>
<tbody>
<tr>
<td>Develop technologies that improve self-sufficiency ratio in the energy supply</td>
<td>Develop and refine ‘3R’ (reduce, reuse, recycle) technologies in a product’s</td>
<td>Develop technologies to reduce the use of substances of high</td>
</tr>
<tr>
<td>at the individual level by further implementation of energy saving measures in</td>
<td>life cycle to achieve reductions in the use of exhaustible resources and</td>
<td>concern and to source alternative materials.</td>
</tr>
<tr>
<td>products and expansion of renewable energy.</td>
<td>water, and to reduce waste.</td>
<td></td>
</tr>
<tr>
<td>Develop information and communication technologies to support lifestyles</td>
<td></td>
<td></td>
</tr>
<tr>
<td>indispensable to realise a low-carbon society.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 35.5.1: Sony’s mid-term targets for the development of environmental technologies.

As an example, Sony has reported a reduction of more than 50 per cent in the total volume of raw material used in their products from 2000 to 2012. During the same time period, the weight of products collected by Sony at the end of product life has increased from 253 to 84,613 tons. A large number of Sony products are now free from hazardous materials such as PVC.

Activity

Car manufacturing and electronics industries make a considerable contribution to the UK GDP, and this contribution is growing.

- Find one sustainability policy for a car manufacturing company and review how comprehensive it is.
- Now find one sustainability policy for an electrical company and review it in the same way.
- Compare the two policies and decide which one is most comprehensive. Do either of these policies need to be updated against current legislation? Do they both have quantitative targets to meet? Note down two ways in which each policy could be improved.

Training and education

Organisations should provide effective environment-related training and education. Good examples include:

- training on various environmental laws and regulations applicable to the business
- education on the identification and safe handling and disposal of hazardous materials
- identification and evaluation of various emissions resulting from manufacturing activities.

Other stakeholders such as suppliers, local authorities and customers should also be made aware of your organisation’s environmental commitments so that they can contribute where possible. Some larger organisations prefer to work with suppliers and sub-contractors who share the same values when it comes to protecting the environment. This might be challenging if you work for a smaller
business but an organisation can create a unique selling point (USP) by stating that it:

- uses sustainable manufacturing methods
- uses renewable energy
- uses recycled and recyclable packaging
- plants a tree for every tree cut down as a result of its business
- does not use products tested on animals.

All these things will enhance a business – and can also help create a social media presence to indicate an organisation’s green credentials.

**Starting new projects**

When starting a new project, environmental impacts should be evaluated and minimised. This has been made a legal requirement by the EU for certain larger projects; project developers are required to carry out an environmental impact assessment (EIA) to identify the direct and indirect effects of a project on:

- humans, plants and animals
- soil, water and air
- climate
- landscape
- material resources.

Project developers also need to consider the interaction between these various elements.

Examples of projects that need to have an EIA include:

- highways
- long-distance railway lines
- new airports with runways longer than 2100 m
- large non-hazardous waste centres with the capacity of more than 100 tons/day
- crude-oil refineries with the capacity of 500 tons or more per day
- thermal power stations with a heat output of 300 megawatts or more
- nuclear power stations and other nuclear reactors, including the dismantling or decommissioning of such power.

For projects with relatively less environmental impact compared to the ones mentioned above, the EU member states can decide whether or not an EIA is needed before the project is approved. Examples of such projects in manufacturing include:

- production of steel, including continuous casting
- processing and foundry of ferrous metals
- manufacturing and assembly of cars and car engines
- shipyards and manufacturing of railway equipment.

One of the recent large projects in the UK that needed an EIA under the EU directive is HS2, the high speed rail network project which is discussed in the following case study.
Case study: HS2
There has been a comprehensive study of the environmental impact of this project. This study considered the impact of the project on:

- agriculture, forestry and soils
- air quality
- climate
- community
- cultural heritage
- ecology
- electromagnetic interference
- land quality
- landscape and visual assessment
- socio-economics
- sound, noise and vibration
- traffic and transport
- waste and material resources
- water resources and flood risk assessment.

The effect of the project on the quality of air has different sources such as construction activities and related traffic movements, and changes to road layouts and traffic flows during the operation of the high speed rail. These changes are more significant near the stations and interchanges. Changes in the air quality could also come from any atmospheric emissions from new buildings. All of these need to be considered in an EIA.

In order to minimise the impact of this project on the local environment, the government has committed to use tunnels, deep cuttings and existing transport corridors. There are also plans to use noise barriers and landscaping to minimise the visual and aural impacts of the project. Some financial compensation has also been available to people who are affected by HS2.

More detailed information is available from: [http://assets.hs2.org.uk/sites/default/files/Vol5_Scope_and_methodology_addendum_CT-001-000.2.pdf](http://assets.hs2.org.uk/sites/default/files/Vol5_Scope_and_methodology_addendum_CT-001-000.2.pdf)

Take it further
Look at the environmental impact studies on HS2 in more depth and at arguments against the HS2 project.

Using the link above and other sources available on the internet, learn more about the environmental impact of the HS2 project and about the solutions that have been put forward to reduce the impact.

Could any of the proposed solutions be drawn on for use within your organisation?

3 Hazardous materials

Some general guidelines for the safe handling, storage and disposal of hazardous materials are outlined below.

- The hazardous characteristics of the materials should be made known to the people who are handling them; for example, hazardous materials can be ignitable, corrosive, unstable (due to a tendency to react with other materials in normal conditions) or toxic.
- Use appropriate waste containers for storage – make sure they are made of an appropriate material and are the right size. The container must remain closed during storage. Regular inspection should be carried out to check for leaks and other possible defects.
- A standard labelling system must be used. The information on the label normally includes the contents, volume and dates.
- Containers must be stored in a safe place.
- A risk assessment should be undertaken on the handling and storage of hazardous materials.
- An updated register of hazardous materials should be maintained.
This last point is particularly important. It is essential that organisations keep an updated register of their hazardous materials or dispose of their hazardous waste in line with related legislation. Even small organisations such as dry cleaners or car repair and service centres produce hazardous waste as part of their operations and therefore should have a procedure to deal with it in an environmentally friendly way. There are various centres in the UK that recycle engine oil and some companies will buy used engine oil and deliver it to these centres. According to the American Petroleum Institute, the required electricity of an average household for 24 hours can be generated from recycling about 2 gallons of oil. However, it is estimated that 200 million gallons of used oil are improperly disposed of each year in the US.

Manufacturers of electronic devices and equipment also use a variety of toxic and hazardous materials such as mercury, lead, cadmium, beryllium and PVC. These companies need to have clear policies and guidelines for dealing with these materials, which should always include guidance on reduction, reuse and recycling.

**Take it further**

Consider the environmental policy of your organisation, or another company working in the same field as yours, and evaluate it. In particular, comment on the presence of SMART targets and consideration of the product life cycle.

You will need to:
- make an accurate evaluation of the impact of work activities on the environment, which normally includes all stages of production, use and disposal (this has been explained in Topic guide 35.4)
- fully understand the related legislation, requirements and other organisational commitments to the environment and make sure all staff are aware of these commitments and comply with the requirements
- set SMART objectives to improve the environmental performance of your work activities (e.g. reduce the energy use and various unwanted emissions, increase recycling and reduce waste).

**Portfolio activity (5.1–5.3)**

By completing the portfolio activity for assessment criterion 2.1 you should have a very good understanding of the impact of your work activities on the environment. These assessment criteria are about reducing the negative and increasing the positive impact of these activities. Consider your work activities and the environment in general and produce a report on the following.

- What are the negative impacts of your work activities and how could these be reduced?
- Are you making a positive contribution to the environment as part of your work activities? How can this be increased?
- Provide a list of environmental legislation and policies related to your work and explain how you would ensure compliance with these laws and guidelines.
- Provide evidence and examples where you have been involved in handling and storing hazardous materials and products, and where you have complied with your organisation’s policies and relevant legislation.
Unit 35: Managing the environmental impact of work activities in manufacturing engineering

35.5: Organising work activities to minimise environmental impact

Checklist
At the end of this topic guide you should be familiar with:
- reducing the negative environmental impact of manufacturing activities through effective planning
- meeting organisational environmental policies and legal requirements
- meeting guidelines and legal requirements regarding handling, storage and disposal of hazardous materials.

Further reading and resources
Guidance on Restriction of Hazardous Substances Regulations 2012:

Reducing environmental impacts across the product life cycle:
http://ecoinfo.cnrs.fr/ACV/hp/dfe_lifecycle_07.pdf

Ford team uses Six Sigma to reduce costs while improving environmental impact:

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