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GUIDE

ENVIRONMENTAL
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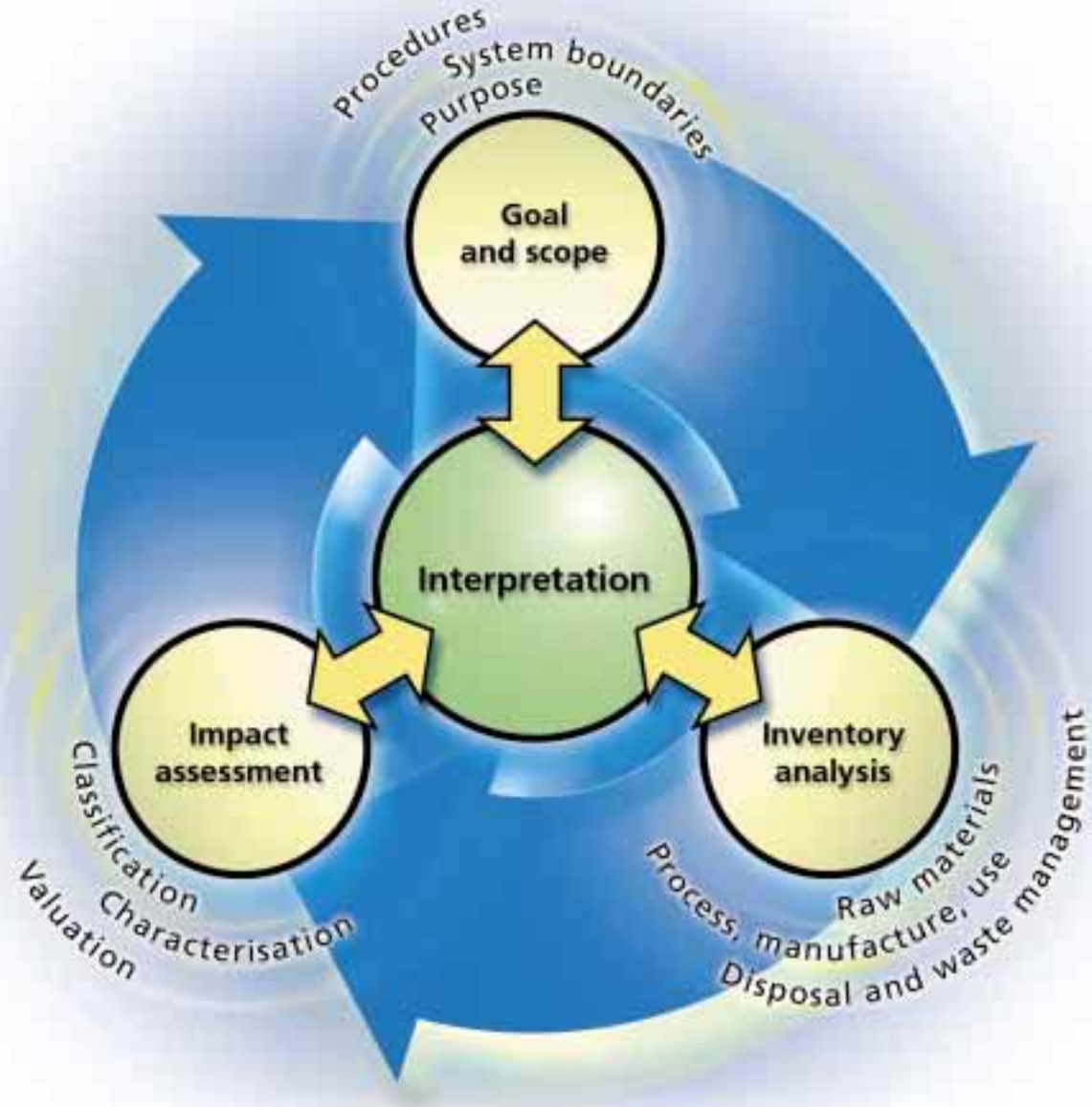
PROGRAMME

LIFE-CYCLE ASSESSMENT - AN INTRODUCTION FOR INDUSTRY



LIFE-CYCLE ASSESSMENT - AN INTRODUCTION FOR INDUSTRY

This publication was produced by the
Environmental Technology Best Practice Programme

Prepared with assistance from:

AEA Technology plc

SUMMARY

Today, companies are faced with ever stricter environmental controls and changing markets in which consumers are becoming increasingly aware of environmental matters. Finding solutions to keep ahead of these issues is not an easy matter, which is why companies need tools to help them meet the challenges of tomorrow. Life-cycle assessment (LCA) is one such tool.

LCA identifies the material, energy and waste flows of a product over its entire life-cycle so that the environmental impacts can be determined. It can help companies to identify changes to their operations, including product design, which can lead to environmental benefits and cost savings.

This Guide provides an overview of LCA and describes how the manufacturing and service industries can use it.

Many companies have used LCA and, as a result, have reduced costs and improved the environmental performance of their organisation and products. For example, Procter and Gamble saved nearly £50 million over a five-year period by reducing waste disposal costs and the use of raw materials.

The Guide gives a brief overview of the components that make up an LCA, its application and benefits to industry and signposts the reader to further information on LCA.

CONTENTS

1 LCA - A NEW TOOL FOR INDUSTRY

Smart companies will be alert to the general direction of environmental regulation and consumer pressure and will find life-cycle assessment (LCA) a useful tool for identifying potential problems before they arise. In many cases, this means finding ways of reducing the use of resources which, in turn, may lead to cost savings.

LCA can be used to evaluate the environmental performance of processes, products and services[1] from 'cradle to grave' and identify potential cost savings. It is relevant to most, if not all, industrial situations where a product is manufactured or a service provided.

There are many reasons why companies should consider improving the environmental performance of their products, such as environmental legislation and pressure along the supply chain. An environmentally-aware public is also demanding better performing products and will buy those that combine the benefits of least cost with good environmental performance. Consequently, an astute manufacturer will seek to develop products that can be marketed against a background of improved environmental performance and, as such, enable it potentially to achieve a market edge over its competitors.

There are also cost savings to be made. Using LCA to address the Company's own waste reduction targets, Procter and Gamble saved over £2 million on waste disposal costs for its European sites and £5 million on material costs in one year alone.

LCA is an effective instrument for informing a company's management about the company's environmental performance, improving its understanding of the environmental impacts of company products and identifying cost savings associated with manufacturing and waste disposal methods. Importantly, it can also inform the market about the environmental performance of a company's products or services. LCA is of potential interest to most, if not all, industrial companies, regardless of how large or small they may be or the products they provide.

Interest in simplified or streamlined LCA is growing because it is recognised that, in many cases, it can achieve results as useful as a 'full' LCA. Streamlined LCA offers the potential to deliver results more quickly and at a lower cost because the scope of the work is reduced. Streamlined LCA is discussed in Section 2.5.

While LCA is a valuable tool, it should be noted that it is a *decision-aiding tool* - it does not make decisions for you.

LCA is a developing science. Internationally, efforts are continuing to improve the method to make it simpler, more robust and, importantly, to develop a standardised methodology (see Section 2.4).

This Guide provides an overview of LCA application and indicates the relevance of LCA to a broad range of issues faced by industry.

[1] Note: For simplicity, throughout the Guide reference is made to 'products' which should be read to include processes and services also.

2 WHAT IS LCA?

2.1 AN OVERVIEW OF LCA

section 2

A definition

LCA identifies the material, energy and waste flows associated with a product over its entire life-cycle so that the environmental impacts can be determined.

Using LCA, it is possible to evaluate the environmental performance of a product from 'cradle to grave', allowing the most significant environmental impacts[2] associated with it during its lifetime to be considered, ie from extracting the raw materials and fuel from the earth through to the product's use and, ultimately, disposal. Fig 1 shows the processes considered in an LCA in terms of the inputs and outputs for a product's manufacture, use and disposal. Note that this representation is a simplification: other processes, such as extraction of raw materials, recycling or energy recovery at the disposal stage have been omitted.

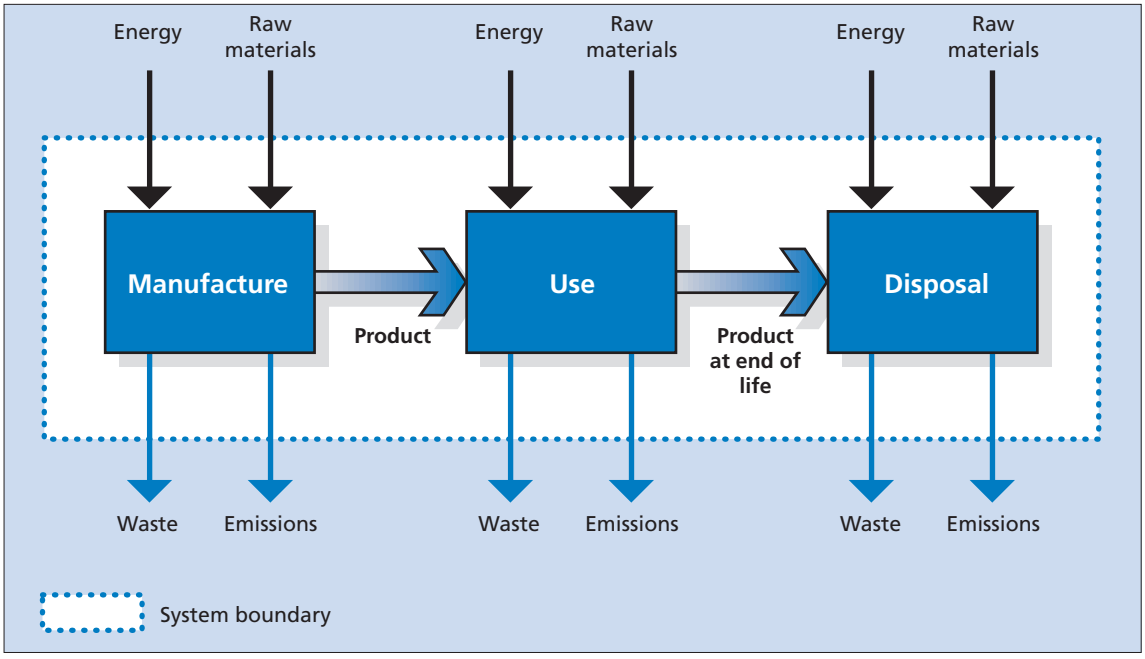


Fig 1 Processes typically considered when conducting an LCA for a product

LCA differs fundamentally from other environmental management tools such as environmental impact assessment and environmental management systems. Most of these consider only a particular site or location and, hence, only the part of the life-cycle which occurs on that site, for example, the manufacturing process itself. LCA integrates over time (the life-cycle) and considers the different geographical sites and stages a product will pass through in its lifetime. By adopting a holistic approach, LCA avoids the problem of shifting environmental impacts to other parts of the life-cycle, eg changing the materials used in production may create less environmental impact at the production site, but increase the environmental impact associated with extraction of raw materials or with product use or disposal. Overall, there may be no net environmental improvement or even an increase in environmental impact.

[2] There are some environmental impacts and issues which LCA is unable to address. Broadly speaking, LCA does not consider non-quantifiable or subjective impacts; examples are odour, visibility and working conditions. In addition, LCA does not consider economic or social factors.

Another key characteristic of LCA is that it considers the most significant environmental burdens and environmental issues. Improvements in any one environmental issue, say global warming, are not made without considering the impacts on another, such as resource depletion.

LCA is a quantitative technique that has the power to inform decision-makers, helping them to make informed and robust decisions.

2.2 WHY WAS LCA DEVELOPED?

LCA is a recent concept which has developed as a consequence of an enhanced awareness of environmental pressures by industry, the public and governments. It has its roots in global modelling and energy audits, performed in the 1960s and 1970s, which investigated the influence of changes in the way society impacts upon natural resources and the environment in general.

Today, the drive behind LCA's development is industry's need for a common analytical method for assessing the environmental impacts of a product throughout its lifetime.

2.3 ELEMENTS OF LCA

LCA is more straightforward than it may appear, as it can be separated into convenient and easy-to-handle phases. Typically these are:

- goal and scope definition;
- inventory analysis;
- impact assessment;
- interpretation.

The relationship of these phases is illustrated in Fig 2.

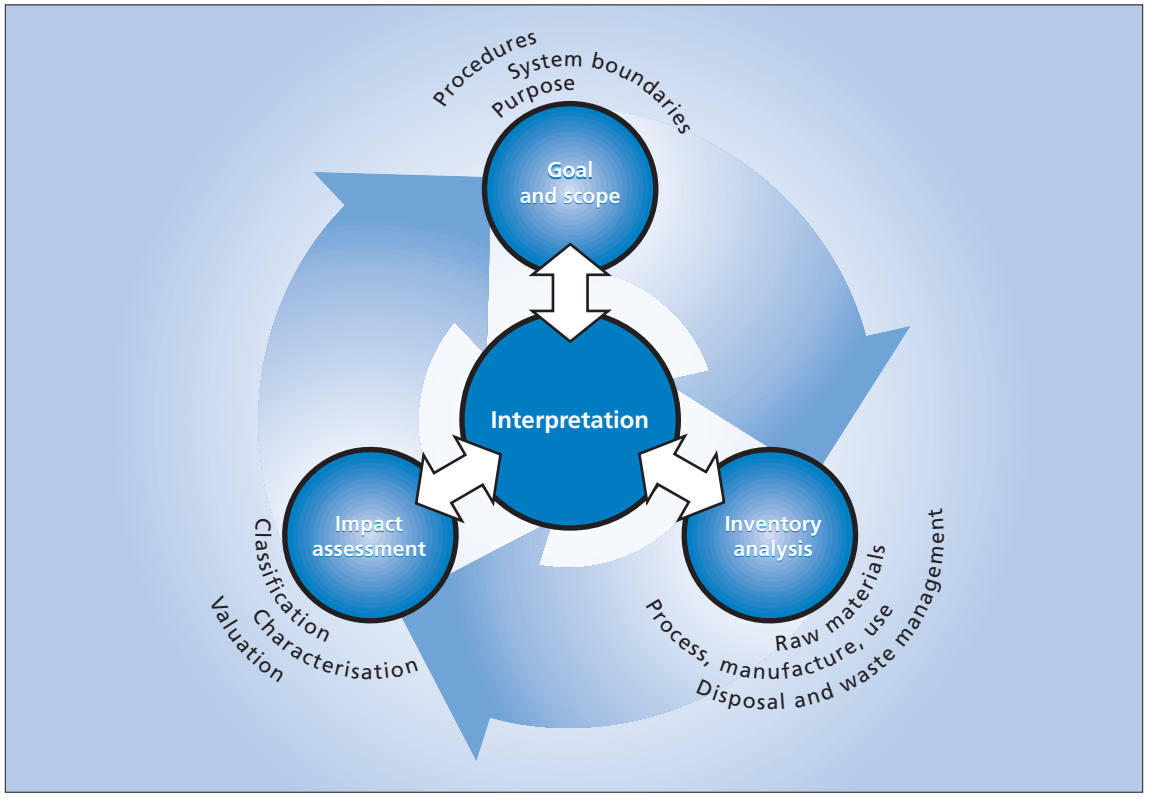


Fig 2 Elements of a full LCA (after B De Smet et al[3])

[3] Environmental Life-cycle Assessment (Chapter 16, De Smet, B. et al), McGraw-Hill, 1996, ISBN 0-070-15063-X.

2.3.1 Goal and scope definition

As its name implies, the **goal and scope** definition phase is the point at which decisions need to be made concerning the purpose of the LCA and what it is going to cover. The goal and scope can be addressed by answering a number of questions:

- What product is the LCA going to deal with?
- Is the LCA going to compare similar products which differ in their design and/or manufacturing process, or is it going to assess a single product?
- Will the LCA involve an assessment of competitors' products?
- What is the product used for? Can a new product perform the same use but in a completely different way?
- Do fitness-for-use criteria or quality standards apply to the product, which may limit design alternatives?
- What environmental issues are of concern to your company or stakeholders?

Another key element of goal and scope definition concerns identification of the study's limits - the so-called system boundaries. Theoretically, a full LCA would include all upstream and downstream processes associated with a product. In reality, the study is scoped to make it manageable by identifying the processes which are key to you, eg those that influence a product's environmental impact most strongly, or those over which you have most influence. For example, should the saw used to cut the trees be included in an LCA of paper production? If so, the environmental burdens of its use need to be identified, which would require an assessment of the components used in its manufacture and operation, the fuel for its operation, etc. An appropriate cut-off point or boundary has to be defined.

2.3.2 Inventory analysis

Once the goal and scope are set, the next phase, **inventory analysis**, involves gathering data on the environmental burdens associated with the product(s) in question. An inventory is simply a listing of how much energy or material is used in each process during a product's manufacture and how much solid, liquid or gaseous waste is generated during its manufacture, use and eventual disposal. Importantly, to aid data interpretation and comparisons, LCA relates each of these environmental burdens to the same functional unit, eg 1 kg of final product[4].

The inventory will contain such data as:

- energy used by the process;
- gases, eg sulphur dioxide and carbon dioxide, emitted to air;
- wastewater for disposal;
- solid wastes to be sent to landfill (or treated via other routes).

Obtaining and collating inventory data can be a time-consuming task, which is why it is common practice for companies to share LCAs or use established LCA computer tools.

2.3.3 Impact assessment

For some LCAs, the completed inventory may be an appropriate point to conclude; it may be possible, from the environmental burdens listed, to identify where a manufacturing process can be improved without recourse to the **impact assessment** phase.

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[4] Depending on the process or product under consideration, the functional unit could be a mass (kilograms), volume (m^3) or a batch size of, say, ten units. Where products with different characteristics are being compared, the functional unit may be defined as the delivery of the service they offer. For example, for comparison of a washing liquid and washing powder the functional unit may be the amount of product required to wash a certain laundry weight.

For other LCAs, the inventory phase will identify a large number of environmental burdens. Interpretation and comparison of the data will be difficult, making an impact assessment phase necessary. Typically, the environmental burdens with the same environmental impact are grouped together in a process called classification. Then an estimate is made of their individual contribution to that particular environmental impact. This process is called characterisation - it allows the most significant burdens to be identified. For example, greenhouse gases would be grouped together, and their total global warming potential calculated. At this point, the life-cycle stage that is the main contributor to an environmental impact may be identified, allowing improvements to be targeted in the most critical processes.

The need for impact assessment

LCAs undertaken for washing machines have indicated that the most significant environmental impacts are due to energy and water consumption during use. From an inspection of the inventories, if one machine uses less water and energy than another, then its environmental impact is the lower of the two. However, if one machine uses less water and the other uses less energy, it is not immediately obvious which has the lower impact. Consequently, the inventories need to be subjected to a more formal assessment using one of the many evaluation and interpretation methodologies.

2.3.4 Interpretation

Throughout an LCA, it is necessary to review and, if appropriate, revise the scope of the study by considering the results emerging from the inventory analysis and impact assessment. The process, called **interpretation**, may be iterative and might, for example, identify data quality issues, eg data gaps, which need to be addressed or suggest the LCA's scope is altered to include another manufacturing process.

In a comparative LCA, the relative performance of products in each impact category can be assessed. Since it is rare that one product performs less well for all environmental impacts, prioritisation is needed. In this case, you must decide which impact category is most important to the environment, your company, your stakeholders, your customers and/or your regulators. Normally, this activity would form part of the initial goal and scope definition phase. Further information about the impact assessment stage of LCA can be found in the references in Section 4.

2.4 LCA STANDARDISATION

There is international interest in standardising LCA, and the main focus for this is a series of standards being developed by the International Standards Organisation, ISO, to cover each aspect of LCA, eg inventory analysis, impact assessment and interpretation. ISO 14040 describes the principles and framework for conducting and reporting LCA studies, and ISO 14041 describes goal and scope definition and inventory analysis. The draft standards ISO 14042 and ISO 14043[5] between them describe the other stages of LCA - impact assessment and life-cycle interpretation respectively.

The standardisation process builds on earlier work carried out by organisations such as the Society of Environmental Toxicology and Chemistry (SETAC), which issued a code of practice that serves as a guide for conducting an LCA[6]. The publication does not prescribe a methodology but is intended to provide information on how to conduct, review, present and use an LCA. The code covers LCA terminology, data quality and how to assure it, presentation of results and LCA applications and limitations.

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[5] ISO 14042 and 14043 are currently Draft International Standards awaiting approval.

[6] *Guidelines for Life-cycle Assessment: A Code of Practice*, 1993, available from SETAC, Avenue E Mounier 83, Box 1, 1200 Brussels, Belgium.

2.5 STREAMLINED LCA

A full LCA for a product, particularly for a complicated product such as a television, can be a time-consuming and costly exercise. Ideally, what is required is an LCA which involves reduced effort and time and, hence, costs but still delivers the key results that would be provided by a more detailed study.

With this in mind, the principle of streamlined LCA has evolved in which the person(s) undertaking the LCA identifies the product or process attributes that are of key significance in the context of the study and includes only these in the streamlined LCA. In other words, elements within the LCA are identified that can be omitted or ignored without impairing the overall result. Examples of streamlining include setting the system boundary such that certain stages in the life-cycle which make insignificant contributions to the environmental burdens are ignored, or reducing the number of environmental impacts considered by including only those of principal interest.

The key issue is how to identify what can be safely omitted from the LCA without impairing the result. A solution is to consider carefully the purpose of the LCA (ie what issue is being addressed?) and, via the goal and scope definition phase, set an appropriate but limited framework for the LCA by one of the following:

- Referring the issue to peers who, through their experience and knowledge, are able to identify the important and less important life-cycle stage(s) or burdens for the product.
- Referring to completed work for similar products and using this to identify the principal life-cycle stage(s) or environmental burdens. The streamlined LCA then concentrates solely on the stage(s) or burdens identified as important for the product by the earlier LCA(s).

Streamlined LCA

The European Union (EU) Eco-label scheme[7] has published LCAs for a number of products. These can help identify the principal life-cycle stages or environmental burdens for products in the same or similar product group.

For example, a light bulb manufacturer could adopt a streamlined LCA having identified from EU Eco-label published work that the most significant life-cycle stage for a light bulb is the in-use phase. Manufacture and disposal can be reasonably omitted on the basis that 90% or more of the environmental impacts resulting from the manufacture, use and disposal of a light bulb occur during use and are attributable to the electricity consumed.

For dishwashers, published work shows that the most significant environmental impacts occur during use, but in this instance are attributable to electricity consumption (principally air emissions), water consumption and detergent use (water emissions). A company might still want to address other issues (for example, those concerning manufacture, packaging and distribution) through the application of best practice, but these issues could be omitted from an LCA.

[7] Details of reports are available on the European Union Eco-label web site at: http://europa.eu.int/comm/environment/ecolabel/index.htm

An example of the use of streamlined LCA

Wanting to explore design and recyclability issues for the telephone sets it manufactures, a company decided that it needed to streamline its LCA to reduce the time and costs related with such a study. The company decided that the principal focus for a streamlined LCA would be those aspects related to the manufacturing design and disposal phases. Other aspects, such as energy consumption in-use, would be ignored.

Refining the scope still further, the company decided that only those production processes which made a significant contribution in terms of either the telephone's mass or environmental hazard, ie hazardous substances, needed to be included in the study. Consequently, the streamlined LCA considered the production of plastics and cardboard, since they accounted for 71% of the product's mass, and the production of the printed circuit board as this contained lead and phenols.

Ultimately, the streamlined LCA helped the company to identify quickly the processes and manufactured components making the most significant contributions to environmental impacts. Information such as this could be used to help with a product's redesign, with a view to reducing energy and materials consumption.

2.6 RELATED ENVIRONMENTAL MANAGEMENT TOOLS

2.6.1 Environmental Management Systems (EMS)

An EMS provides a company with an integrated approach to managing and monitoring its environmental impacts and complying with environmental regulations. An effective and efficient EMS will give a company the opportunity to reduce its environmental impact, increase efficiency (and possibly reduce costs) and enhance its reputation. An important element of an EMS is the internal audit process - a mechanism necessary to monitor the management system and to assess whether objectives and targets are being met. While LCA is not a requirement of an EMS (or ISO 14001 and EMAS, both outlined below), its use can assist the identification and minimisation of the environmental effects of a company's operations.

2.6.2 ISO 14001

ISO 14001, *Environmental Management Systems - Specification with Guidance for Use*, is an international standard. It specifies the requirements for an EMS to be certified by an accredited, independent third party which assesses whether a company meets the requirements to be awarded an ISO 14001 certificate. ISO 14001 contains five main principles:

- establishing a company environmental policy;
- planning by setting objectives and targets to address company environmental impacts;
- implementing and operating the environmental management system;
- monitoring the system and taking corrective action, as appropriate;
- undertaking a management review to assess the effectiveness of the system.

Over 1 000 certificates had been awarded to UK companies by July 1999.

2.6.3 Eco-Management and Audit Scheme (EMAS)

EMAS is a voluntary European Union initiative. Introduced in April 1995, it recognises the achievements of companies which have taken positive steps to protect the environment. The European Commission has agreed that ISO 14001 satisfies the management system requirements of EMAS. They are complementary rather than competitive; the main difference between the two is that EMAS requires a company to report its environmental performance publicly and have the report audited independently. By July 1999, the number of European sites registered for EMAS reached 2 500.

Benefits of ISO 14001 and EMAS - a potential role for LCA

To attain ISO 14001 certification or EMAS registration, a company needs to be informed about the environmental effects of its operations and requires a mechanism for identifying how improvements can be made - a role suited to LCA. For example, LCA can help managers to identify improvements in a production or waste management process. It is worth noting that, as a result of improving their environmental performance, many companies are able to achieve manufacturing cost savings which offset the costs associated with attaining ISO 14001 or EMAS:

- at one of its sites, National Power turned a £200 000 annual cost into a £20 000 annual profit by adopting a number of measures including sending more wastes for re-use and recycling[8];
- after achieving EMAS registration, Woodcote Industries reported savings of £320 000 due to energy and waste reduction[8];
- Layezee Beds is saving £250 000/year on energy and raw material costs[8].

2.6.4 European Union Eco-label scheme

In the past, manufacturers devised their own methods for determining, and then stating, the environmental performance of their products. Recognising that the marketplace was often confused by manufacturers' claims, the European Union (EU) established the Eco-label scheme based on standard assessment criteria. The scheme aims to develop labels for certain products that inform purchasers of the environmental performance of the product.

LCA is fundamental to the scheme. The scheme works by assessing the LCA results for a product group, say dishwashers, and then developing several criteria based on the identification of the most significant environmental impacts. Thresholds are then set for these criteria. Applications for the award of an Eco-label are assessed against the criteria.

Having undertaken a number of LCA studies, the Ecolabelling scheme now operates with a subtle modification - it uses 'life-cycle considerations' (in other words, streamlined LCA) to aid the development of product group criteria. The driver behind the change is the recognition that streamlined LCA can deliver results more quickly and with lower costs than if a full LCA is undertaken.

Criteria for the award of Eco-labels to a broad range of product groups have been approved with criteria for many other product groups being developed. Those already approved include:

- bed mattresses;
- copying paper;
- dishwashers;
- footwear;
- laundry detergents;
- light bulbs;
- paints and varnishes;
- personal computers;
- refrigerators;
- soil improvers;
- textiles;
- tissue paper;
- washing machines.

Some 240 products across the EU now carry Eco-labels.

[8] Source: ENDS Report No 269, June 1997

3 HOW CAN LCA HELP ME?

3.1 USING LCA

An LCA can be used by your company to provide information internally, for example, to identify waste reduction opportunities, or externally to help you market your products. It is important to note that the information required by these audiences is likely to be different, although you will need to gather similar data in both cases.

There are also opportunities to share an LCA with other companies. Members of a trade association may wish to pool resources to achieve a shared goal, such as providing the public with information about the environmental performance of their generic product. Companies operating in different industrial sectors, but which are part of a supply chain, may also identify an opportunity to share an LCA. For example, a vehicle manufacturer may team up with a metals supplier to assess the effects of using a material in a new way. Sharing an LCA can be a useful way of aiding data collection and dividing costs.

When considering an LCA, you should consider not only the resources and manufacturing processes but also the use and disposal phases of your product's life-cycle. The reason is that for many products, for example, batteries, cars and domestic appliances, the most significant environmental impacts occur during their use or disposal. Consequently, an LCA that focused on manufacturing could misinform decision-makers and miss the opportunity to achieve the most significant benefits.

For many products, one or two stages in their life-cycle account for the bulk of their environmental impacts. In such cases, a streamlined LCA can be used to good advantage.

3.2 APPLICATIONS AND BENEFITS

A number of applications and reasons exist for using an LCA:

- to improve efficiency and reduce costs;
- product design;
- product marketing;
- supply chain pressure;
- compliance with environmental legislation.

LCA can lead to cost savings being realised by manufacturers. In some instances, for example, low-energy appliances, cost savings may accrue to the consumer instead.

Sections 3.2.1 to 3.2.5 outline a number of potential applications for LCA.

3.2.1 Efficiency and cost savings

By tracking energy and material inputs and waste outputs through production processes, it is possible to identify stages in production where efficiency can be enhanced. Reducing the impact of a product means being more efficient with materials and the energy required during manufacturing processes. Increased efficiency will, therefore, lead to cost savings by reducing the quantities of materials and energy bought in and, by reducing wastes, savings on rejected materials and disposal costs.

Procter and Gamble

Wishing to improve the environmental performance of one of its detergent brands, Procter and Gamble redesigned the product's packaging, replacing the original rigid, plastic bottle with a new plastic pouch. At the product's launch, the press pointed out that the original bottle was more recyclable than the pouch and questioned whether it would be better to continue using the bottle. Procter and Gamble had already used LCA developing new packaging and so used LCA again to investigate the effects of household recycling habits. At the time, households recycled just 5% of plastic packaging. Using LCA, Procter and Gamble proved that, even if this increased to 70%, the new pouch would outperform the bottle in its environmental performance by using less energy and being responsible for fewer emissions to air and water. Consequently, in a marketplace where the buying public were becoming ever more conscious of environmental issues, Procter and Gamble was able to market its newly packaged product as a genuine environmental improvement.

3.2.4 Supply chain pressure

LCA is a valuable tool for businesses, such as retailers, where the main environmental impacts to be influenced occur upstream (with suppliers) or downstream (with the end consumer). In other words, to minimise the impact of its own goods, a manufacturer will seek to purchase from a supplier that can demonstrate that its environmental performance is among the best in its sector.

It is not unusual for a manufacturer to require its suppliers to improve their environmental performance in order to retain its custom. Consequently, suppliers may find a tool such as LCA useful to help them demonstrate the environmental performance of their products and so retain existing customers or win new ones.

B&Q

B&Q has a well-established system of working with its suppliers to reduce the environmental impacts of key product groups, such as timber, flooring, wallcoverings, bathroom accessories and paints. In consultation with its suppliers, the Company reviews the life-cycle factors in some of the key products which it stocks, to identify the most important issues for each product group and set targets to stimulate improvements in environmental performance. In the case of wallcoverings, for example, the issues identified were the use of pulp certified by the Forestry Stewardship Council (FSC), recycled paper, chlorine bleach, solvent-based inks and packaging. All the targets set so far have been achieved and the Company has now gained third-party certification that its wallcoverings come from well-managed forestry.

3.2.5 Compliance with environmental legislation

Regulatory requirements are being tightened continually and, in combination with competition within industrial sectors, concerns about compliance can encourage manufacturers to seek ways to improve their environmental performance and reduce their costs. For example, many manufacturers are seeking ways to reduce or minimise waste from their operations, not only to identify ways of meeting the legislative requirements, but also because waste reduction can bring dramatic results in terms of materials and energy cost savings, increased efficiency and cleaner production systems.

3.3 COST-EFFECTIVENESS

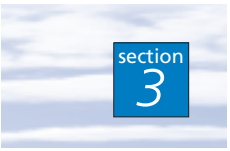
To maximise the cost-effectiveness of an LCA, it is important to consider at the outset:

- what you want to get out of the LCA;
- how you intend to approach it.

These points form part of the goal and scope definition phase covered earlier. If you use an LCA as part of a formal, in-house, environmental improvement programme, you will need to allocate more resources than if the LCA is used as a quick 'spot-check' to weigh up the merits of two possible options for a product. Furthermore, if you wish the results of your LCA to be made public, the LCA needs to be conducted in a thorough manner to ensure its credibility.

LCA is flexible and can be tailored to meet your needs. If you need something that can be carried out in-house and is both quick and low-cost, then a simple, streamlined LCA can be defined. If you need something that will stand up to peer review and examination by a certified organisation, a thorough and credible LCA, perhaps performed by an independent third party, may be appropriate.

According to the LCA Sourcebook[10], a comprehensive LCA, involving inventory analysis and impact assessment, could take several person-months to complete. On the other hand, a simple inventory analysis may require just a few days to finish. It is worth noting that the LCA Sourcebook provides valuable guidance and useful contacts.



[10] *LCA Sourcebook: A European Business Guide to Life-cycle Assessment*, Society for the Promotion of LCA Development (SPOLD), 1993, ISBN 0-952-1904-0-0.

4 I'M INTERESTED: I NEED FURTHER INFORMATION

If you would like further information on LCA, the following sources will be of help to you.

4.1 LIFE-CYCLE ASSESSMENT

LCA Sourcebook: A European Business Guide to Life-cycle Assessment, Society for the Promotion of LCA Development (SPOLD), 1993, ISBN 0-952-1904-0-0.

Environmental Life-cycle Assessment, McGraw-Hill, 1996, ISBN 0-070-15063-X.

Integrated Solid Waste Management: A Life-cycle Inventory, Blackie Academic and Professional, 1995, ISBN 0-7514-0046-7.

Guidelines for Lifecycle Assessment: A Code of Practice, 1993, available from SETAC, Avenue E Mounier 83, Box 1, 1200 Brussels, Belgium.

4.2 EUROPEAN UNION ECO-LABEL SCHEME

Details can be obtained from the UK Eco-label Competent Body:

Department of the Environment, Transport and the Regions
Zone 6/D10
Ashdown House
123 Victoria Street
London SW1E 6DE
Tel: (020) 7944 6576
Fax: (020) 7944 6559

The European Commission's Eco-label web site is a good source of information about the Eco-label, providing details of the scheme's aims, operation, product group LCA reports and product group criteria. Its address is: http://europa.eu.int/comm/environment/ecolabel/index.htm

4.3 ISO STANDARDS

Copies of ISO standards 14001, 14040 and 14041 can be purchased from:

BSI Information Centre
389 Chiswick High Road
London W4 4AL
Tel: (020) 8996 7000
Fax: (020) 8996 7001

4.4 ENVIRONMENTAL LABELS

ISO is developing standards for environmental labels. Copies of ISO 14020: 1998 '*Environmental Labels and Declarations - General Principles'* and ISO 14021: *'Environmental Labels and Declarations - Self Declared Environmental Claims (Type II Environmental Labelling)'* can also be obtained from the BSI Information Centre.

4.5 EMS AND EMAS

The Environmental Technology Best Practice Programme (ETBPP) Environment and Energy Helpline can provide information on all aspects of environmental performance, including EMS.

Tel: Freephone 0800 585794

The Institute of Environmental Management and Assessment (IEMA) is the Competent Body responsible for EMAS in the UK. Requests for further information should be made to:

IEMA EMAS Helpline
Tel: 01522 540069

5 GLOSSARY

Burden

'Burden' is a term used to describe the materials and energy used to make, use or dispose of a product and the resultant emissions to air, land and water. A product may have many burdens associated with it, such as CO_2 or wastewater, and therefore an inventory needs to be developed to identify them all.

Characterisation

The process by which the significance of a product's environmental burdens are quantified.

Classification

The process by which environmental burdens are grouped into impact categories such as acidification and global warming.

Environmental impact

Once a set of burdens has been identified for a product, it is useful to know something of the overall implications of those burdens. This 'aggregated' consideration is referred to as the environmental impact.

Functional unit

When conducting an LCA, it is necessary to consider a process's energy and material flows through the input and output stages with respect to an appropriate unit, so that all flows are considered on an equal footing. Such a unit is called the functional unit and can take a number of forms including mass, volume or a given number of a manufactured article.

Impact assessment

The process by which burdens identified in an inventory are assessed so that an overall environmental impact can be identified.

Impact categories

Environmental burdens can have a number of potential effects on the environment, such as global warming, acidification and human health effects - these are called impact categories. To form an appraisal of the burdens, it is advisable to group the burdens into several impact categories to aid assessment.

Life-cycle assessment

The technique whereby the environmental impacts of a material, process or product are identified and assessed over its entire life-cycle.

Life-cycle inventory

The result of gathering data on all the energy and material input flows required by a process or product and all the output emissions to air, water and land, including solid waste.

Streamlined LCA

An LCA with reduced scope such that only those issues considered to be of principal significance are taken into account.

System boundary

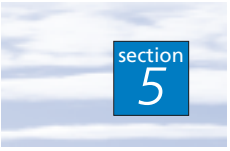
When conducting an LCA, it is necessary to identify the limits of the study, ie how far back and forward in a product's life-cycle it is necessary to gather data. For example, in the case of a washing machine, upstream options include placing the boundary at the factory gate (ie the point where materials are received) or at the point where raw materials are extracted from the ground.

System flows

The term used to denote the energy and material inputs to a process or product and the output emissions to air, water and land, including solid waste.

Valuation

The process by which impact categories are assessed for their relative importance.



The Environmental Technology Best Practice Programme is a Government programme managed by AEA Technology plc.

The Programme offers free advice and information for UK businesses and promotes environmental practices that:

- **increase profits for UK industry and commerce;**
- **reduce waste and pollution at source.**

To find out more about the Programme please call the Environment and Energy Helpline on freephone 0800 585794. As well as giving information about the Programme, the Helpline has access to a wide range of environmental information. It offers free advice to UK businesses on technical matters, environmental legislation, conferences and promotional seminars. For smaller companies, a free counselling service may be offered at the discretion of the Helpline Manager.

FOR FURTHER INFORMATION, PLEASE CONTACT THE ENVIRONMENT AND ENERGY HELPLINE

0800 585794

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