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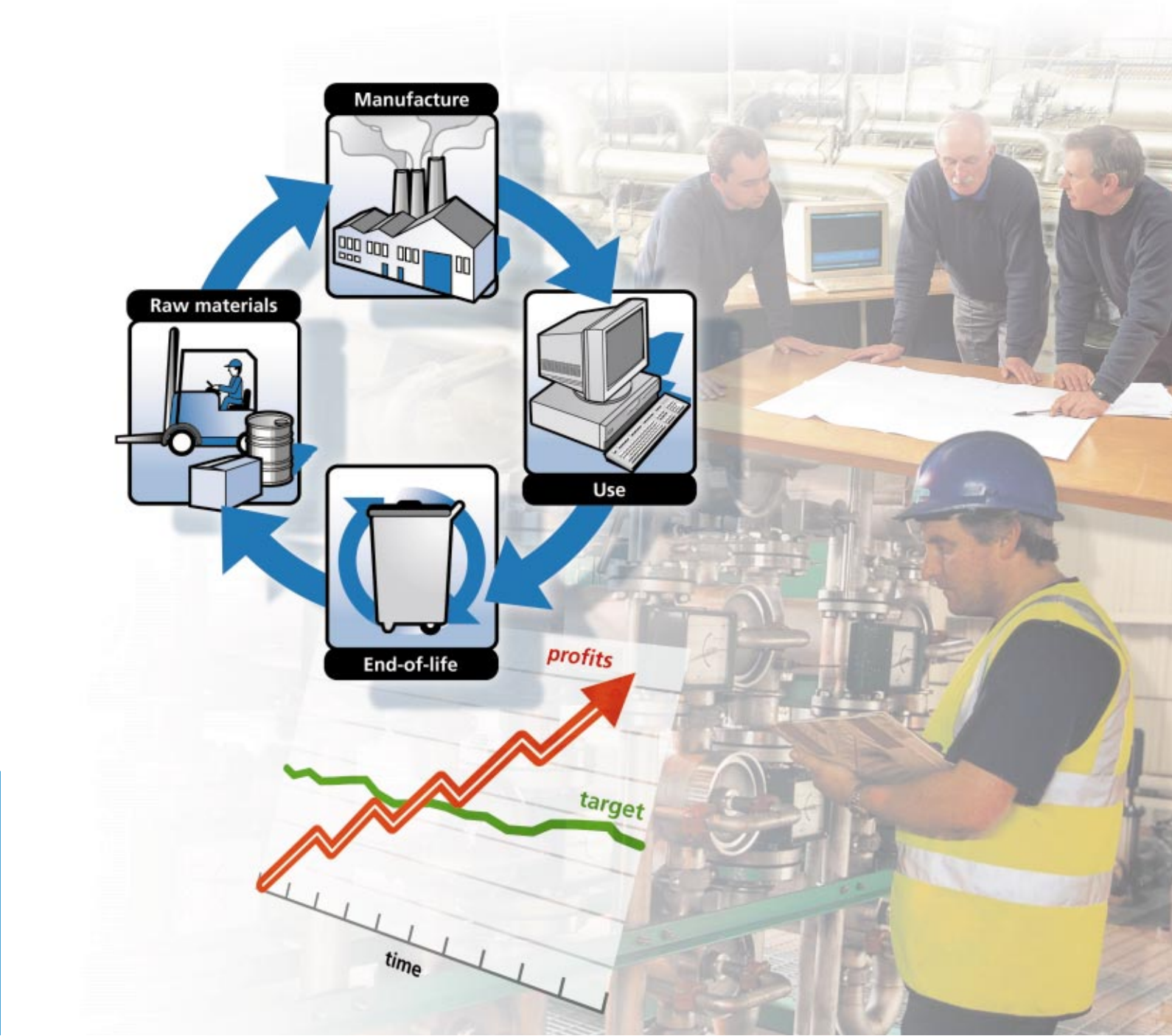
GG288

Cleaner technology: an essential guide for industry



Cleaner technology: an essential guide for industry

This Good Practice Guide was produced by Envirowise

Prepared with assistance from:

WS Atkins Environment

Foreword from the Confederation of British Industry

For a company to be truly competitive it needs to deliver improvements in performance across all areas of its business. As environmental regulations tighten and competitive pressures increase, failure to maximise the use of your resources and minimise waste production could prove an expensive mistake for many companies. The introduction of the Climate Change Levy, a tax on energy use, highlights how companies must increase their resource productivity.

This Guide has been written with your business's interests at heart and outlines the opportunities and challenges that cleaner technology represents to all process and manufacturing companies. Whatever stage you are at, investigating what cleaner technology can bring to your business will both benefit your bottom line and improve your relationships with key stakeholders such as financial institutions, customers and local communities.

Cleaner technology may require initial investment; however, its rewards could be substantial for the future of your business. It is about changing your production process to make cleaner products, thereby generating less waste and using less resources. Furthermore, implementing cleaner technology will help your company align with environmental regulations and gain accreditation to EMAS and ISO 14001.

As with all aspects of business performance, best practice is key. This Guide, together with the many other products produced by Envirowise, will help you meet the challenge of running a business in the 21st Century.

Digby Jones
Director-General
Confederation of British Industry

Summary

This Guide provides an overview of cleaner technology and signposts to other sources of information about the range of opportunities available to UK companies.

Cleaner technology is about using innovative technologies and techniques to increase process efficiency and reduce waste. Cleaner technology has direct business benefits, including increased profits, increased competitiveness and enhanced market penetration.

The Guide describes a systematic approach to implementing cleaner technology and how to select the most appropriate and cost-effective cleaner technology options.

The Guide is divided into five sections which are colour-coded for ease of navigation:

- implementing cleaner technology;
- designing cleaner products;
- optimising processes;
- using new technology;
- recovering and re-using materials.

Industry Examples illustrate the significant cost savings and other benefits achieved by UK companies that have implemented cleaner technology.

Introduction to cleaner technology

Cleaner technology is about improving your company's competitiveness. By implementing innovative techniques, you can increase the efficiency of your production process and reduce waste. Changing your production process to prevent or reduce waste is more cost-effective than using end-of-pipe techniques.

Cleaner technology includes:

- designing cleaner products;
- optimising processes;
- using new technology;
- recovering and re-using materials.

Adopting a cleaner technology approach can significantly improve your company's profitability and environmental performance. Direct business benefits include:

- cost savings from reduced raw material and utility consumption;
- reduced waste treatment and disposal costs;
- improved process control and product quality;
- continued compliance with the increasing requirements of environmental legislation;
- improved opportunities for positive marketing features leading to increased sales;
- improved customer/supplier relationship;
- increased competitiveness.

Other, less obvious, benefits can include lower insurance premiums or less need for emissions monitoring to demonstrate compliance with environmental regulations. Many companies that have implemented cleaner technology have also benefited from increased employee motivation and a better working environment.

This Guide describes a step-by-step approach to help you to identify and select the cleaner technology options that are most applicable to your operations. It signposts you to other relevant publications and sources of practical advice on implementing cleaner technology. The Guide also helps you to think through the implications of implementing cleaner technology at your company by focusing on the benefits gained, and the lessons learnt, by leading UK companies.

Cleaner technology areas

Implementing cleaner technology

Laying the foundations for cleaner technology will support decision-making processes and increase the value gained from its implementation.

Designing cleaner products

Incorporating environmental considerations into a product's design can result in significant cost savings and enhanced product function.

Optimising processes

Changing the process flow or reducing variability will make your process more efficient and reduce waste and raw material costs.

Using new technology

Investigating newer, cleaner equipment, and updating your production line will increase process efficiency, reduce waste and material costs and make your factory more competitive.

Recovering and re-using materials

Segregating waste streams allows greater recovery, re-use or recycling of raw materials and by-products. Recovering substances from mixed waste streams will also reduce your overall waste treatment and disposal costs.

Relevant Envirowise and other publications to help you are listed on pages 14 - 17 of this Guide. Using these publications will help you to find out more about the implementation of cleaner technology in UK industry.

Implementing cleaner technology

Implementing cleaner technology involves encouraging people to take an innovative approach to:

- identifying opportunities to reduce waste;
- considering options for improvement;
- evaluating the feasibility and potential benefits of technical solutions.

The steps outlined below provide a checklist of actions to help you carry out this process. It is important to ensure that the foundations are in place to encourage people to identify those areas where cleaner technology will have the greatest impact. Time invested to inspire people to generate innovative suggestions for improvement will be amply repaid through the significant cost savings achieved when these are implemented. Having identified the areas for improvement, the process of considering the options and evaluating the potential solutions is similar to that for any business efficiency project.

Step 1: Laying the foundations for cleaner technology

Start by ensuring that mechanisms are in place to encourage your staff to identify and act upon opportunities to implement cleaner technology, for example:

- Seek management commitment to a project to identify and assess opportunities for cleaner technology.
- Include a commitment to adopt cleaner technology improvements in your company's environmental policy.
- Give someone with appropriate technical knowledge the responsibility for identifying cleaner technology opportunities. Ask this person to keep a watching brief on:
  - developing technologies, eg through discussions with equipment and material suppliers;
  - more cost-effective techniques for compliance with existing and forthcoming legislation.
- Summarise basic cost information about your process, such as the costs associated with raw materials, utilities, waste disposal etc. Don't forget to include the 'hidden' costs of waste such as wasted labour, lost product sales, effluent treatment costs etc.
- Ensure that cleaner technology opportunities are assessed when new equipment or process changes are considered.
- Make sure that effective communication methods are in place to gain commitment and enthusiasm from the workforce for cleaner technology initiatives.

These steps will help you to identify those areas where cleaner technology improvements can have the greatest impact.

Step 2: Considering the options

Once you have identified the areas you want to improve, the next step is to consider the cleaner technology options available to you. Think about where it would be best to make changes to minimise waste and how to optimise the business benefits to your company of cleaner technology.

Follow the colour coding on the following pages to find out more about the four areas of cleaner technology, ie:

- designing cleaner products;
- optimising processes;
- using new technology;
- recovering and re-using materials.

Use this information to help you decide which of the opportunities you initially identified will be the most cost-effective for your company to implement.

Step 3: Making the change

The final step is to evaluate the feasibility and potential benefits of a particular cleaner technology opportunity:

- Assess available technical approaches:
  - use the publications signposted in this Guide to obtain detailed information on specific solutions and technologies;
  - consult equipment and material suppliers.
- Undertake a cost-benefit analysis of your list of possible solutions.
- Obtain management approval to trial your chosen approach.
- Undertake a trial:
  - gather base-line data on existing performance and costs;
  - plan the trial and identify the parameters to be monitored to assess the benefits;
  - gather monitoring data during the trial period;
  - assess overall performance and revise your cost-benefit analysis.
- Implement your chosen approach and continue to monitor performance.
- Report on, and promote the benefits of, your cleaner technology solution.

Don't stop now. Build on your success and identify another cleaner technology opportunity to address. Relevant Envirowise publications on implementing cleaner technology are listed on page 14 of this Guide.

Designing cleaner products

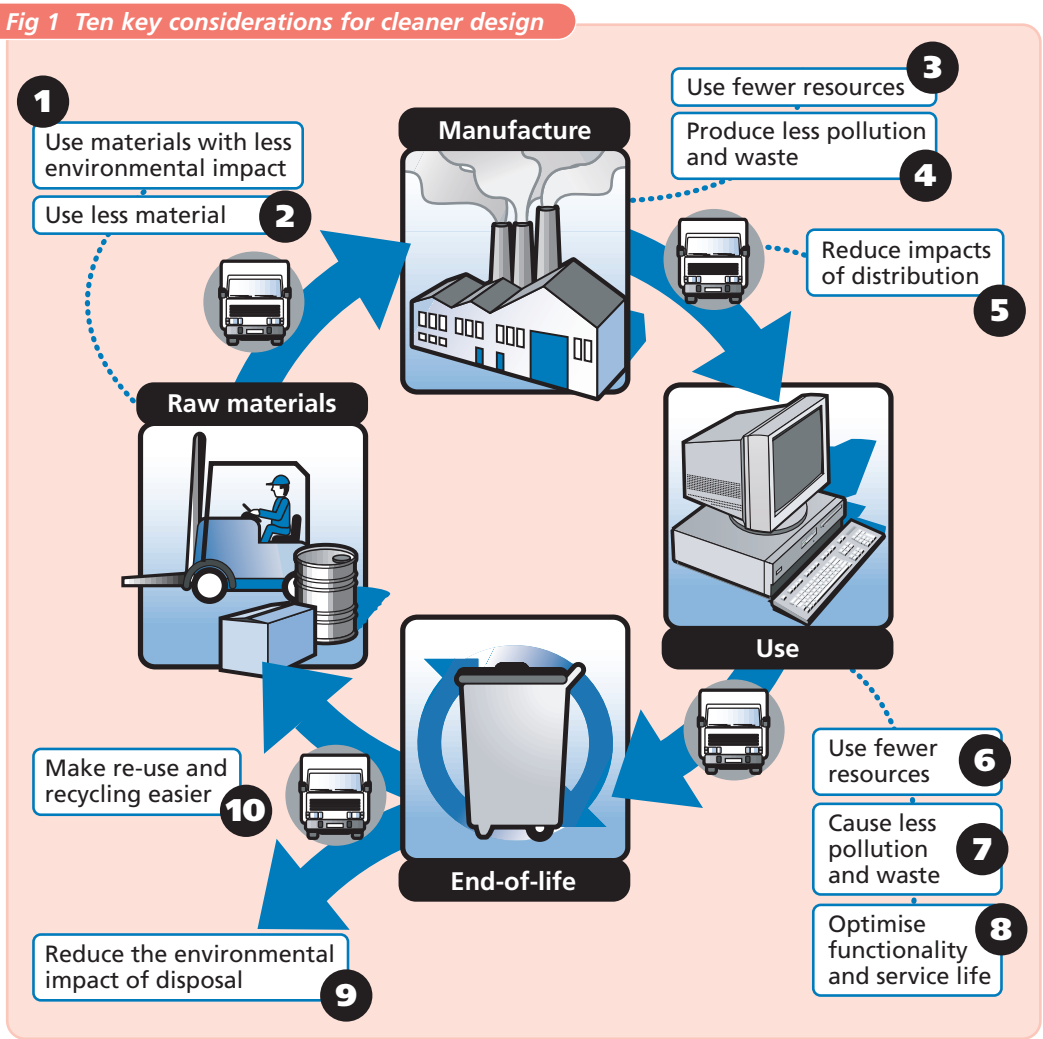
Using the design process of a product or service to minimise the environmental impact over its entire lifetime can improve competitiveness substantially. The business benefits of designing cleaner products include:

- lower production costs;
- improved product functionality and quality;
- increased market share;
- easier disassembly and increased potential for recycling;
- improved customer/supplier relationship;
- continued compliance with legislation, eg packaging waste regulations and the end-of-life vehicles directive.

Approach

Cleaner design involves identifying how a product gives rise to environmental impacts during its life-cycle and how these impacts can be reduced. A product's environmental impacts can be reduced by addressing ten key considerations (see Fig 1) covering each stage of its life-cycle (raw materials, manufacture, use and end-of-life).

Fig 1 Ten key considerations for cleaner design



The aims of designing cleaner products include reduced raw material use, elimination of hazardous materials, reduced energy and water consumption, the production of less waste and pollution, increased service life and greater recyclability. Tools and techniques you can use include:

- life-cycle assessment (LCA) - a formal procedure based on databases of comparative impacts (see publication ET257 *Life-cycle Assessment - An Introduction for Industry*);
- abridged life-cycle assessment (see publication ET257);
- product checklists containing life-cycle considerations specific to a particular product (see publications GG294 *Cleaner Product Design: An Introduction for Industry* and GG295 *Cleaner Product Design: Examples from Industry*);
- design for assembly/disassembly - considers life-cycle issues for recycling a product (see publication GG296 *Cleaner Product Design: A Practical Approach*).

Details of all the publications mentioned above are given on page 15.

Industry examples

Driving down waste puts the brakes on costs

When one of the customers for its brake calipers decided to launch a new car model, Continental Teves UK Ltd took the opportunity to propose design improvements to reduce waste, machining requirements and, hence, unit cost. The new design caliper has reduced caliper weight by 26% and overall production time by 42%, while delivering equivalent braking performance.

New design caliper fitted to a wheel knuckle (left) compared with an equivalent conventional two-part caliper (right)

Electronic equipment manufacturer benefits from cleaner design

Varian's simulator with collimator highlighted

In response to commercial and corporate pressures and the proposed EC waste electrical and electronic equipment directive, Varian Medical Systems UK Ltd redesigned the collimator unit of its radiotherapy simulator using an in-house method for cleaner product design. As a result, the company achieved cost savings of £162 000/year and significantly improved its competitive advantage.

"The cleaner product design approach has proved to be a real eye-opener, taking away preconceptions and resulting in products with significant cost savings and better functionality."

John Peel, Managing Director, Varian Medical Systems UK Ltd

Further details of relevant Envirowise and other publications on designing cleaner products are listed on page 15 of this Guide.

Optimising processes

Optimising processes usually involves changing the process flow and/or improving process control. Depending on your company's requirements, these can be implemented separately or together. Optimising processes may require new technologies (see pages 10 and 11).

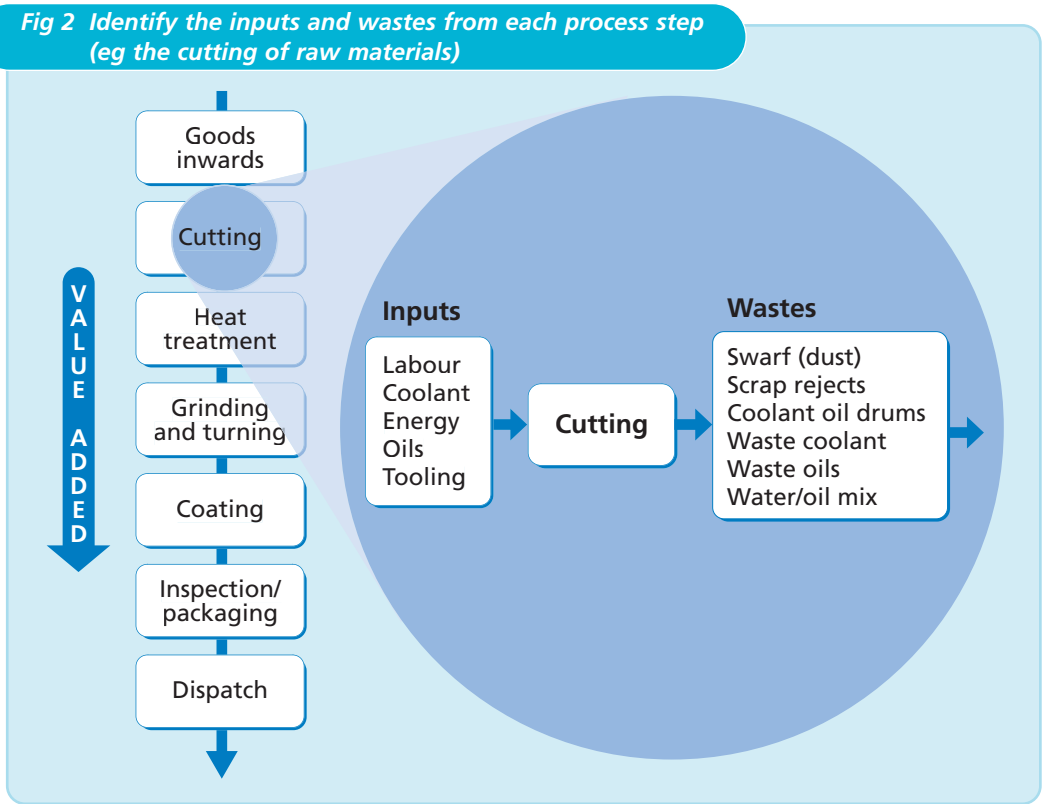
The business and environmental benefits of optimising your process include:

- increased yield of saleable product;
- improved product quality and thus less need for rework;
- improved efficiency and reduced process time.

Approach

A clear understanding of your process is essential for process optimisation, so start by preparing a process map. Identify the inputs and wastes for each process and add these to the map (see Fig 2). Then quantify the raw materials, ancillary materials, utility consumption and waste for each process step.

Fig 2 Identify the inputs and wastes from each process step (eg the cutting of raw materials)



Consider the function of each process step and how it feeds into the next step.

- Is each step necessary and can any process steps be combined?
- Could waste be prevented or reduced by altering the sequence of steps?
- Could wastes from different process steps be re-used elsewhere in the process?

Computer modelling can help you to assess the cost and environmental benefits of proposed changes alongside their potential impact on production parameters. This technique is especially useful for more complex processes.

Processes that produce large and variable amounts of waste can often benefit from improved process control. The first step is to identify the parameters affecting the amount of waste. An effective process control system typically consists of a method of measuring key parameters, with a controller and a control device (eg a valve) linked in a feedback loop. The controller can range from manual monitoring to a fully automated system.

Common types of process control system include:

- manual methods such as control charts and visual checks (eg adjusting a valve after reading a level indicator), which require staff training to follow the control procedures (see publications GG223 *Preventing Waste in Production: Industry Examples* and GG224 *Preventing Waste in Production: Practical Methods for Process Control*);
- simple feedback systems, eg a direct relationship between the monitoring of key parameters and their effect on a control device (see publications GG223 and GG224);
- computer controllers, where monitoring data are processed before controls are adjusted (eg publication GC23 *Improved Process Control Reduces Mould Losses*);
- tagging devices, such as bar codes (eg publication ET186 *Using Tagging for More Cost-effective Manufacture and Supply*).

Details of all the publications mentioned above are given on page 16.

Industry examples

Water pinch study pays major dividends

Faced with the need to spend £10 million on a centralised biological effluent treatment plant, Monsanto plc (now Solutia) applied water pinch analysis to minimise water and wastewater at its speciality chemicals site in Newport. The water pinch method used computer modelling to optimise water resources. As a result, opportunities for reducing site water consumption by 44% were identified which equate to a potential saving of £320 000/year.

Assessing opportunities for water re-use

Improved process control reduces mould losses

Corus Foundry's automatic mixer control system

Corus Foundry installed an automatic mixer control system to help reduce mould scrap rates. This reduced the number of defective moulds by over 60% and achieved net cost savings of £37 000/year, with a payback period of just seven months. Tighter process control also enabled the company to reduce the amount of resin and catalyst used, thus reducing volatile organic compound (VOC) emissions.

"...reliability and consistency has allowed Corus Foundry to reduce both its operating costs and the environmental impact of its moulding operations."

Mr I England, Technical Manager, Corus Foundry

Further details of relevant Envirowise and other publications on optimising processes are listed on page 16 of this Guide.

Using new technology

Using new technology can involve either changing to a cleaner process, in place of more environmentally harmful ones, or installing cleaner equipment, or doing both. Implementing cleaner processes and installing cleaner equipment can help you to:

- reduce costs;
- improve efficiency;
- reduce raw material use and waste generation;
- improve product quality.

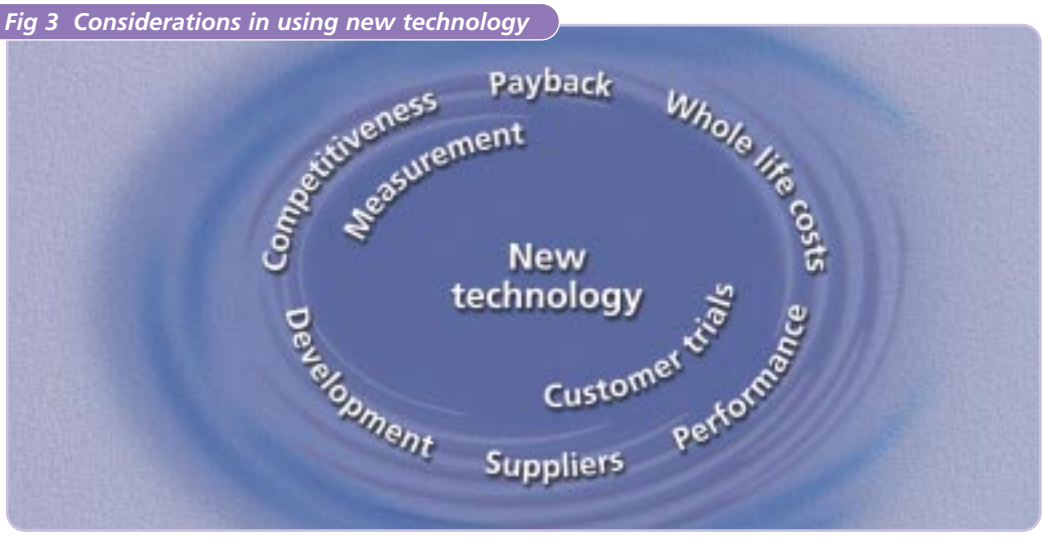
Approach

The steps involved in selecting and implementing cleaner processes or installing cleaner equipment are similar to those for any other new equipment or process:

- Follow the generic steps for implementing cleaner technology outlined on pages 4 and 5.
- When considering the options, identify the performance criteria you require (in addition to capital and operating cost considerations) including:
  - issues such as operational performance, customer requirements and environmental benefits;
  - plant-specific issues, eg effect on product quality, health and safety, space, operating life of plant, project timescales, documentation and training requirements;
  - contractual issues, eg exactly what is being supplied, performance guarantees, post-instalment services and the supply of spare parts.

  It may be necessary to start by making assumptions about the performance of the new technology or equipment until you have obtained further information about the specific technologies available. Assessing technologies that are 'foreign' to your business (eg the use of biotechnology in chemicals manufacturing) can be difficult, with initial misunderstandings common. Efforts made to understand the new technology better will reduce these risks, and put the company in a better position to evaluate competing products and services. This may require bringing new skills into the company, either by recruitment or through studentships or the TCS (formerly Teacher Company Scheme). Some of the above and other factors to consider when deciding to use new technology are shown in Fig 3.

Fig 3 Considerations in using new technology



- When making the change, review the technology options available, eg through discussions with equipment suppliers, trade associations and research organisations.
- Where suitable solutions are not readily available, you may choose to develop new cleaner technologies yourself to meet your company's needs. This is often best done in partnership with equipment suppliers and can sometimes be eligible for funding from local sources and Government programmes such as LINK and the Sustainable Technologies Initiative (STI).

Help from Envirowise

Implementing new technology is often process-specific. The Environment and Energy Helpline on 0800 585794 can:

- signpost you to relevant Case Studies, Guides and research project profiles published by Envirowise;
- advise on potential Government sources of part-funding for the development of novel cleaner technologies and on the TCS.

Industry examples

Cleaner technology brings cost savings and environmental improvements

Control room for the new mixing facility

Following an environmental review in 1996, MacDermid plc took the opportunity to incorporate several cleaner processes and techniques when installing a new mixing facility at its Birmingham factory in 1999. The resulting fully-computerised mixing facility is energy efficient and has virtually no discharge, with wash waters being re-used in later batches. The new facility has reduced water consumption by 80%, reduced effluent volumes by 94% and produced cost savings of £189 000/year.

"As well as saving us money and significantly reducing our environmental impacts, the new process has led to a culture change, modernising attitudes across the company."

MacDermid plc

Business and environmental benefits of waterless printing

Waterless presses at The Beacon Press

To raise its environmental performance, improve its product quality and generate new marketing opportunities, The Beacon Press has switched completely from isopropyl alcohol (IPA) based printing to new waterless printing technology. Conversion to waterless printing has eliminated the use of IPA (a highly flammable organic solvent with known health risks), reduced paper wastage by 30%, reduced operating costs and improved the quality and consistency of products.

Further details of relevant Envirowise publications on using new technology are listed on page 16 of this Guide.

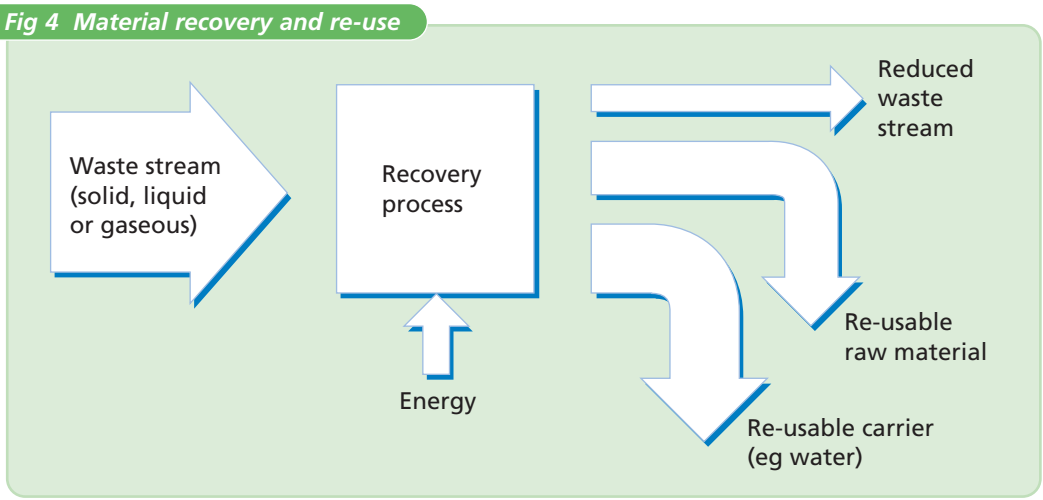
Recovering and re-using materials

Many industrial processes generate waste streams containing a mixture of materials. Where possible, it is most cost-effective to prevent or reduce the amount of waste generated in the first place, through product design, process optimisation and using new technology, and to segregate waste streams. However, there may be some waste streams where such approaches are not feasible. In these circumstances, recovery of material from mixed wastes may reduce the cost of treatment.

The many business benefits of recovering and re-using raw materials and by-products include:

- cost savings from the re-use of the recovered materials and by-products on-site;
- revenue from their sale to other companies for recycling or recovery;
- cost savings through avoided waste treatment and disposal charges.

Fig 4 Material recovery and re-use



Approach

- Follow the generic steps for implementing cleaner technology outlined on pages 4 and 5.
- Characterise the waste stream you wish to treat, eg composition, temperature, pH, flow rate and volume.
- Assess other key factors affecting the choice of technology, eg space, the nature of substances to be recovered, capital cost, operating costs and legislative requirements.
- Review available technology options by consulting equipment suppliers. The Environment and Energy Helpline (0800 585794) can tell you about different separation technologies and provide contact details for equipment suppliers.

The wide range of recovery technologies available includes:

- **Separation of dissolved substances from liquids**, including adsorption, ion exchange, precipitation, electrical technologies, evaporation, distillation, dissolved air flotation (DAF) and air/steam stripping (see publication GG37 *Cost-effective Separation Technologies for Minimising Wastes and Effluents*).
- **Separation of gases from liquids**, including separation vessels, defoaming processes, demisters and electrostatic precipitation (see publication GG37).

- **Separation of gases from gases** (eg solvent capture), including adsorption, condensation and absorption (scrubbing) (see publications GG12 *Solvent Capture for Recovery and Re-use from Solvent-laden Gas Streams* and GG100 *Solvent Capture and Recovery in Practice: Industry Examples*).
- **Membrane technologies.** These are particularly effective for:
  - the recovery and re-use of both water and raw materials;
  - the separation of mixtures of materials, eg solids from gases, gases from gases, dissolved or colloidal materials from liquids, solids from liquids, gases from liquids, and liquids from liquids (see publication GG54 *Cost-effective Membrane Technologies for Minimising Wastes and Effluents*).

Details of all the publications mentioned above are given on page 17.

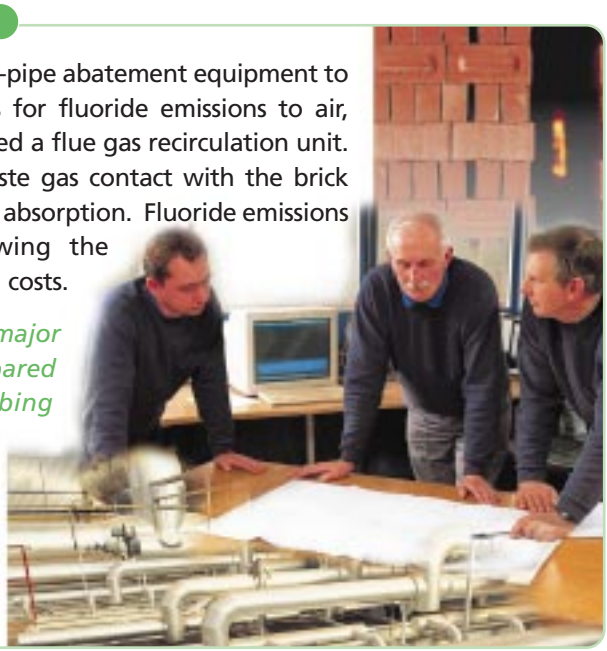
Industry examples

Cost-effective reduction of emissions

Rather than install expensive end-of-pipe abatement equipment to comply with new regulatory limits for fluoride emissions to air, Ibstock Building Products Ltd installed a flue gas recirculation unit. The recirculation unit increases waste gas contact with the brick product, thereby increasing fluoride absorption. Fluoride emissions have fallen by 65%, thus allowing the company to save £277 000 in capital costs.

"...this type of technology has major environmental advantages compared with 'end-of-pipe' gas scrubbing techniques."

Mr J Kailofer,
Technical Manager,
Ibstock Brick Leicester Ltd



Reviewing the flue gas recirculation unit

Membrane technology turns effluent into cost savings

Kronospan Ltd installed a membrane-based system to recover re-usable water and fibres from effluent generated during wood fibreboard manufacture. The new system has avoided the off-site tankering of 48 000 m^3/year of effluent, reduced mains water consumption by 44 000 m^3/year and replaced about 480 tonnes/year of raw materials with recovered solids. The company negotiated a lease-purchase agreement with the equipment supplier and has achieved net cost savings of £250 000/year.

The membrane-based system allows virtually 100% material recovery and re-use of treated water

Further details of relevant Envirowise and other publications on recovering and re-using materials are listed on page 17 of this Guide.

Envirowise and other publications to help you

Envirowise publications are available, free of charge, through the Environment and Energy Helpline on freephone 0800 585794. They can also be ordered via the Envirowise web site at www.envirowise.gov.uk. Information about how to obtain publications from other sources is given where they appear in the text.

Cleaner technology

UNEP Internet database at www.emcentre.com/unepweb/tec_case/index.htm

This web site contains a wide range of cleaner technology case studies from around the world. The case studies can be viewed on-line and may give you useful ideas for cleaner technology opportunities at your company. The database menu allows you to browse specific industry sectors and sub-sectors.

Implementing cleaner technology

Workforce Partnerships to Reduce Waste and Save Energy (ET228) - describes how to build workforce partnerships and generate staff commitment to implement environmental improvements.

Investing to Increase Profits and Reduce Wastes (GG82) - describes how to assess the financial benefits of cleaner technology and how to present this information to persuade banks and other lending institutions to finance any capital investment needed for cleaner technology improvements. The Guide contains industry examples and checklists to help with financial appraisal.

Choosing Cost-effective Pollution Control (GG109) - describes a step-by-step approach to choosing cost-effective pollution control and includes worksheets to help you characterise your company's emissions and effluents. The general approach described in the Guide is also applicable to choosing and implementing cleaner technology.

Designing cleaner products

Cleaner Product Design: An Introduction for Industry (GG294) - explains what cleaner design is, the benefits of incorporating cleaner design and what it involves.

Cleaner Product Design: Examples from Industry (GG295) - describes how ten well-known companies have implemented cleaner design.

Cleaner Product Design: A Practical Approach (GG296) - provides a practical introduction to cleaner design with a focus on dismantling.

Getting the Most from Plastics (FP272) - describes how process modelling can be used as an approach to implementing cleaner design.

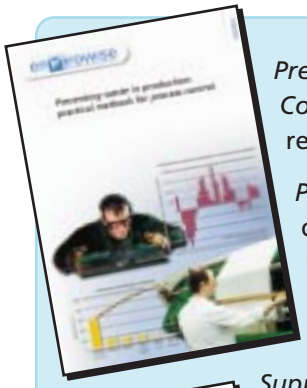
Life-cycle Assessment - An Introduction for Industry (ET257) - describes how to undertake a life-cycle assessment (LCA) and the associated benefits. Also contains industry examples and signposts to further information.

Life-cycle Assessment: what it is and how to do it. UNEP Cleaner Production Publication 14. Describes what LCA is, explains how to do it and gives a worked example. Price £30 from SMI Distribution Services (Tel: 01438 748111; Fax: 01438 748844).

Driving Down Waste Puts the Brakes on Costs (GC236) - describes how Continental Teves UK Ltd used cleaner design to reduce production costs and strengthen the customer/supplier relationship.

Electronic Equipment Manufacturer Benefits from Cleaner Design (NC201) - describes a demonstration project at Varian Medical Systems UK Ltd using a systematic approach to cleaner design which has resulted in substantial cost savings and improved competitive advantage. More detailed information is given in an associated report (NR201).

Optimising processes



Preventing Waste in Production: Practical Methods for Process Control (GG224) - describes how to improve process control to reduce waste during production.

Preventing Waste in Production: Industry Examples (GG223) - describes how ten companies have used production data analysis to improve control of their processes and reduce waste, thus achieving significant cost savings and environmental benefits.

Using Tagging for More Cost-effective Manufacture and Supply (ET186) - describes different types of tagging device and how they can be used to optimise efficiency by tracking products during manufacture and distribution.

Improving Competitiveness Through Control - from the DTI's Advanced Control Technology Transfer (ACTT) Programme - describes a variety of process control techniques and how they can be used. Available free from the DTI on 020 7215 1344.

Water Pinch Study Pays Major Dividends (NC55) - describes how Monsanto plc used computer modelling to optimise water use and re-use within the process.

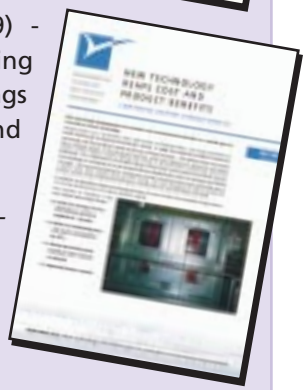
Improved Process Control Reduces Mould Losses (GC23) - describes how Corus Foundry (formerly British Steel Engineering, now part of The Corus Group) used an automated control system to reduce scrap levels and operating costs.

Statistical Process Control Saves Money (CH65) - describes how Fenner Conveyor Belting reduced waste and achieved cost savings by implementing a computer-based statistical process control system with no need for capital investment.

Using new technology

Cleaner Technology Brings Cost Savings and Environmental Improvements (NC260) - describes how a new chemical mixing system at MacDermid Canning plc led to significant cost savings from reduced water consumption and effluent volumes.

Business and Environmental Benefits of Waterless Printing (GC238) - describes how changing from IPA-based printing to waterless printing enabled The Beacon Press to improve product quality and gain new marketing opportunities.



New Technology Reaps Cost and Product Benefits (NC139) - describes how the installation of a new state-of-the-art dyeing machine at Shrigley Dyers Ltd delivered substantial cost savings through reduced utility use, shorter processing time and improved process control.

A Novel Membrane Bioreactor for the Recovery of Valuable By-products (NC200) - describes a project at Elf Atochem UK Ltd to develop and trial a new membrane technology to extract and treat toxic organic pollutants from an inorganic waste stream, thus turning it into a saleable by-product. More detailed information is given in an associated report (NR200).

Recovering and re-using materials

Cost-effective Separation Technologies for Minimising Wastes and Effluents (GG37) - describes proven techniques for the separation of heavy metals, anions, organics and gases from liquid wastes.

Cost-effective Membrane Technologies for Minimising Wastes and Effluents (GG54) - describes how to use ultrafiltration, reverse osmosis and nanofiltration, and microfiltration to separate mixtures of liquid materials.

Solvent Capture for Recovery and Re-use from Solvent-laden Gas Streams (GG12) and *Solvent Capture and Recovery in Practice: Industry Examples* (GG100) - describe proven technologies for the capture, recovery and subsequent re-use of organic solvents from solvent-laden gas streams.

Improving the Performance of Effluent Treatment Plant (GG175) - describes ways of reducing effluent treatment costs by at least 5% and presents four case studies.

Cost-effective Reduction of Fluoride Air Emissions Through Process Optimisation (NC178) - describes how recycling waste gases back into the process allowed Ibstock Building Products Ltd to achieve substantial cost savings and meet regulatory requirements.

Membrane Technology Turns Effluent into Cost Savings (NC259) - describes how Kronospan Ltd installed a membrane-based system to recover re-usable water and fibres from wood fibreboard manufacturing effluent, thus reducing raw material and waste disposal costs.

Ultrafiltration Puts an Attractive Face on Cosmetics Production (NC138) - describes how The Body Shop International plc improved wastewater treatment and achieved cost savings of nearly £200 000/year by installing ultrafiltration membrane units.

Biotechnology Tackles Abattoir Waste (NC17) - describes how ED Jones and Son Ltd installed a novel biological treatment system to treat high-strength abattoir wastewaters to produce a biomass with potential commercial value and treated effluent suitable for re-use.

Where next?

This Guide has provided information on what cleaner technology involves. It introduces ideas about how your company could benefit from implementing cleaner technology.

Remember that cleaner technology can increase your company's competitiveness by:

- reducing operating costs;
- improving product quality;
- enhancing its market penetration;
- improving stakeholder relationships;
- improving its environmental performance;
- ensuring cost-effective compliance with existing and forthcoming legislation.

Start down the path to achieving these benefits by obtaining copies of the publications mentioned in this Guide that you think are most relevant to your needs.

The poster provided with the Guide summarises the advice given in its five main sections, ie:

- implementing cleaner technology;
- designing cleaner products;
- optimising processes;
- using new technology;
- recovering and re-using materials.

Why not put up the poster by your desk as a reminder to yourself? The poster may also attract the attention of others and help to get discussions about cleaner technology started in your company. If there is no poster with your Guide, or to receive additional copies for display, contact the Environment and Energy Helpline (0800 585794) and ask for one to be sent to you.

Envirowise - Practical Environmental Advice for Business - is a Government programme that offers free, independent and practical advice to UK businesses to reduce waste at source and increase profits. It is managed by AEA Technology Environment and NPL Management Limited.

Envirowise offers a range of free services including:

- Free advice from Envirowise experts through the Environment and Energy Helpline.
- A variety of publications that provide up-to-date information on waste minimisation issues, methods and successes.
- Free, on-site waste reviews from Envirowise consultants, called Fast Track Visits, that help businesses identify and realise savings.
- Guidance on Waste Minimisation Clubs across the UK that provide a chance for local companies to meet regularly and share best practices in waste minimisation.
- Best practice seminars and practical workshops that offer an ideal way to examine waste minimisation issues and discuss opportunities and methodologies.

envirowise
Practical Environmental Advice for Business

Harwell International Business Centre | 156 Curie Avenue | Didcot | Oxfordshire | OX11 0QJ
E-mail: helpline@envirowise.gov.uk Internet: www.envirowise.gov.uk

For further information please contact the

Environment and Energy Helpline
0800 585794