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Case study: achieving a 'negative' carbon footprint

Stephen Ormrod explains the steps Edwards went through

VACUUM technology company Edwards set out to evaluate its carbon footprint in 2007.

An external environmental survey let it benchmark its performance. Edwards also took part in Business in the Community's Environmental Index, which analyses the environmental performance of major UK-based companies.

The Environment Index showed that Edwards was performing reasonably well but that there was room for improvement. Its suggestions fall into two areas: Firstly, reducing the company's contribution to global warming by reducing or abating the energy its products use; its own emissions; and its customers' emissions, particularly potent greenhouse gases such as polyfluorocarbons (PFCs).

Secondly, Edwards was working to reduce the hazardous waste going to landfill, through increased product reuse, and by reducing the hazardous content of its products.

reducing contribution to global warming

• **More energy efficient vacuum pumps:** Edwards has a total global installed base of around 500,000 vacuum pumps. Many of these are used in the semiconductor industry, where pumps belonging to the top five suppliers alone consume over 3×10^9 kWh per year – equivalent to a city the size of Sheffield.

Edwards' latest generation dry pumps use 30% less energy, with features such as standby mode and proximity pumping to reduce energy consumption further, and the latest generation of abatement products are also lower powered.

• **Lowering company emissions:** Edwards focused on reducing its use of solvents. In production, solvent cleaning fluids have largely been replaced with water. Our remanufacturing operations have installed a water-based cleaning system using filtered recirculated water. These ensure

that any hazardous materials resulting from customer use of the pump are removed and dealt with appropriately.

• **Abatement systems – reducing customers' emissions:** Semiconductor manufacturing involves many gases that need careful handling. PFCs are a prime example, because of their persistence and high global warming potential.

Edwards has developed abatement systems which enable customers to minimise emissions of PFCs without creating any other hazardous products. For example, the Edwards thermal processing unit destroys PFCs and also destroys other fluorine compounds without producing PFCs as by-products.

reducing the hazardous waste going to landfill

In our view, product reuse is a more efficient way of reducing waste than recycling.

The company decontaminates and remanufactures used pumps to 'as-new' condition – some 30,000 pumps are reused every year. This reduces raw material and energy use, as well as the amount of material that has to be recycled. Edwards' water-based cleaning process avoids the creation of more environmental problems from solvent use, with contaminants filtered out to be disposed of in an appropriate manner.

Edwards vacuum pumps typically run 24/7 and are reused four to ten times over their 10–20 year lifetime, making them extremely environmentally efficient. This is equivalent to a car travelling around 2m miles!

The company also provides a free recycling service for gauges and controllers used within the EU.

Products going to landfill at the end of their life can create significant problems. In addition to complying with legal regulations, Edwards is voluntarily

complying with RoHS (Restriction of Hazardous Substances), slowly eliminating all six restricted substances (lead, cadmium, mercury, hexavalent chromium, fire retardant polybrominated biphenyls and polybrominated diphenyl ethers) from its product ranges.

calculating carbon footprint

Taking all of these initiatives into account, Edwards has made the initial calculation of its carbon footprint based on the currently accepted practice and a similar estimation made by a semiconductor OEM.

The currently-accepted model for calculating a company's carbon footprint is a full lifecycle analysis, which takes into account the emissions resulting from a product in the field as well as those arising from its manufacture. The typical OEM footprint (Figure 1) shows a small contribution resulting from materials, facilities and transport, with the majority of the footprint generated by products in use.

In comparison, Edwards' estimated carbon footprint is shown in Figure 2. Manufacturing, remanufacturing and product use contribute some 2m t/y of carbon dioxide equivalent.

The full lifecycle calculation also includes the contribution of the company's abatement products, which remove greenhouse gases. Edwards' abatement products prevent the emission of some 6m t/y of CO₂ equivalent by its customers.

With this taken into account, Edwards has a 'negative' carbon footprint of about 4 t/y of CO₂ equivalent.

Our abatement products make a significant contribution to reducing our sector's carbon footprint. Using the lifecycle model, these appear as part of Edwards' carbon footprint, and so we can be viewed as 'carbon negative'. However, the most important thing is not who this reduction is attributed to but the end result – reducing global warming. **tce**



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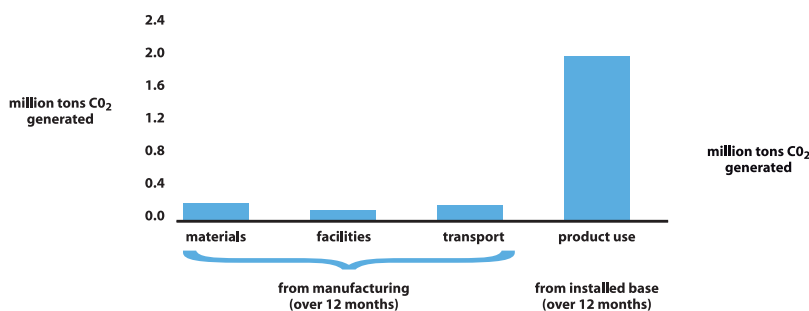


Figure 1: Carbon footprint for typical semiconductor OEM

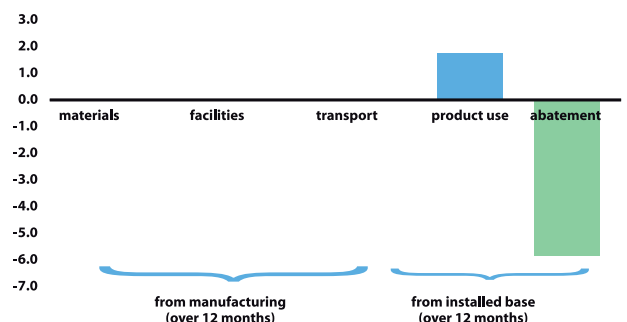


Figure 2: Calculation of Edwards' carbon footprint