An Introduction to Remanufacturing
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About the Centre for Remanufacturing & Reuse
The Centre is run by Oakdene Hollins Ltd as a pilot programme under the Defra BREW programme. Oakdene Hollins is a sustainable innovation and resource management consultancy working for both public and private sector organisations. Over the last ten years, Oakdene Hollins has carried out extensive research into remanufacturing activities in the UK; the current work under BREW was established to provide an in-depth examination of remanufacturing and reuse options and how they can contribute to an economy of sustainable production and consumption in the UK.

The first year of the Centre’s work for BREW (2006/07) comprised a pilot programme that collected evidence as a basis for further intervention in Year 2. Over 16 product groups were examined in order to determine their remanufacturing potential and produce intervention strategies. This was backed by an industrial Stakeholder Event to test the findings and Year 2 priorities, as well as other fundamental work conducted on terminology, reuse, and decision support and policy action. The second years’ work addresses the actions identified in year one, working with groups of remanufacturers to tackle key barriers to progress, sometimes in conjunction with other BREW delivery bodies.

The Centre has a website dedicated to the dissemination of information on remanufacturing activity in the UK. Here, interested parties can find resources for purchasers and (re)manufacturers, read case studies, engage in the debate, join the mailing list or view the news feeds and more.

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About Envirowise
Envirowise is a Government-funded programme dedicated to putting the sustainable use of resources at the heart of UK business practice. Since 1994 Envirowise has helped UK businesses save over £1 billion by enabling them to significantly reduce their environmental impact. Envirowise offers businesses of all sizes and sectors a wide range of free, independent and practical advice designed to genuinely improve their processes, profitability and competitiveness. Services include:

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• An encyclopaedic website of valuable and relevant information
• On-site visits conducted by a nationwide team of expert advisors
• Over 200 events each year, from product design workshops to major exhibitions
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Additional information
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Introduction

This short guide provides an introduction to remanufacturing, its definition, value to the economy and the environment, and characteristics of the process that are amenable to intervention to boost activity. It is supplemented by two case studies, one of a remanufacturer, and one of a user of remanufactured goods. The examples have been chosen because the products and industries are within common reach, the activities involved are easily understood and the reasons and benefits simple to evaluate.

There are many more examples across the broad range of industry, and these are noted within the guide. This is only a brief introduction to remanufacturing and its possibilities, but further in-depth knowledge of remanufacturers and remanufacturing issues can be obtained by contacting Envirowise and its agents, or the Centre for Remanufacture and Reuse at the contacts on page 2.

About Remanufacturing

Remanufacturing is an industrial practice which can be summarised as:

“A series of manufacturing steps acting on an end-of-life part or product in order to return it to like-new or better performance, with warranty to match.”

It is typically applied to complex manufactured products that possess significant embedded material, energy and labour resources, most of whose value can be recovered by suitable remediation techniques. From the perspective of the purchaser or user, the product behaves like new and is backed up by an appropriate warranty from the seller or remanufacturer.

Often, remanufacturers take the opportunity to upgrade the products from old to current performance standards of energy efficiency or productivity. This is one way that they can be differentiated from simple repair items and other end of life treatments, as illustrated in Figure 1.

Of all the current reuse options processes, remanufacturing alone requires the total dismantling of the product and the restoration and replacement of its major components. It concentrates on activities higher in the value chain than reuse or recycling, considering cost-effective expenditure of materials, energy and time. Remanufacturing takes place to a greater or lesser extent in most industrial sectors, as shown in Table 1 on page 4.

Figure 1. Hierarchy of Recovery Techniques in Value Chain
Remanufacturing is also a relatively hidden industry. This is because it has been taking place profitably in many sectors driven by recognising the residual value of end-of-life products. A recent study placed a value of £5 billion on remanufacturing activity in the UK, with remanufactured parts often selling at higher profit margins than new sales. This level of activity was comparable to the value of the recycling industry in 2003.

However, the savings in materials also translates into savings in energy – up to 90% of the original inputs. Estimated UK-wide savings are 270,000 tonnes of raw materials and 800,000 tonnes of CO₂. Combined with the skilled jobs created, remanufacturing is an activity that can have all-round sustainability benefits, as well as offering earnings potential to Original Equipment Manufacturers who adopt it alongside new product manufacture. In return purchasers of remanufactured goods can expect to pay less than for new – typically 50-70% - without compromising quality or their environmental commitments.

In general there are three classes of remanufacturer: The OEM, the contracted “official” agent, and the independent operator. In the first two cases, OEMs retain at least some control over both the rewards and the quality of the remanufactured product. Relationships between contractors and OEMs can involve mutually beneficial information flows regarding both original design specifications and product failure modes and frequencies; these can be used to enhance product design, design for remanufacture and even upgrade paths for old generation products.

Independent operators usually provide a service in segments where the OEM is not deeply involved in direct customer support (such as out-of-warranty automotive), or simply concentrates on new sales. OEMs may re-enter remanufacture where they recognise that their strong brand name is being parasitized, and technological advances offer strong upgrade potential. This has happened in the machine tool area, where computer control technologies may be retrofitted to high-longevity basic equipment.

<table>
<thead>
<tr>
<th>Product</th>
<th>Company</th>
</tr>
</thead>
<tbody>
<tr>
<td>Machine tools</td>
<td>Jones &amp; Shipman, Millbrook, Douglas-Curtis, Marrill</td>
</tr>
<tr>
<td>Pumps</td>
<td>Weir, Plenty, Sulzer, Johnson</td>
</tr>
<tr>
<td>Compressors</td>
<td>Comptec, Flatwoods, J&amp;E Hall, ThermoCom</td>
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<tr>
<td>Refrigeration installations</td>
<td>Bond Group, Manor Concepts</td>
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<tr>
<td>Starter motors</td>
<td>Sovereign</td>
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<tr>
<td>Automatic transmissions</td>
<td>Mitchell-Cotts, ATP</td>
</tr>
<tr>
<td>Car and truck engines</td>
<td>Autocraft, Ivor Searle, Perkins, Caterpillar</td>
</tr>
<tr>
<td>Photocopiers and printer</td>
<td>Xerox, Danwood, Greenstrike, many others</td>
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<tr>
<td>consumables</td>
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<tr>
<td>Excavation equipment</td>
<td>Powerhire, Blackhill Engineering</td>
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<tr>
<td>Power turbines</td>
<td>Alstom</td>
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<tr>
<td>Defence equipment</td>
<td>Vickers, BAe Systems, ABRO</td>
</tr>
<tr>
<td>Computer and telecomms equipment</td>
<td>Sony, Solectron</td>
</tr>
</tbody>
</table>

Table 1. List of Remanufacturers

Remanufacturing Benefits

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“... remanufacturing is an activity that can have all-round sustainability benefits...”
Remanufacturing as a Process

Remanufacturing shares many features of normal manufacturing, particularly in relation to the aspects of output quality control, materials flow handling, and other principles of lean manufacturing. Significant differences do arise from the fact that the raw materials – core – at the input to the process is of unknown quality. This has implications for evaluation of suitability for remanufacture, and the processes of testing, verifying or remediation at the component level. Figure 2 illustrates the remanufacturing process.

A more serious challenge exists for independent remanufacturers. Access to product engineering data can be seriously restricted; in response leading remanufacturers have built reverse engineering capabilities that attempt to determine product specifications by deconstruction of original equipment items.

These issues can be seen as barriers to remanufacture or as points of attack by OEMs. However, the most advanced OEMs do not perceive remanufacturing to be – in principle – any different to new manufacture, and can run both operations in parallel at the front end, and sharing parts management, assembly and processes logistics at the back end.

Remanufacturing as a Service

To derive maximum benefit, remanufacturing depends on the customer recognising the value of his end-of-life asset, and the manufacturer creating products that have the required durability in critical components. Both these motives can be enhanced if the goods can be seen less as products and more as a service.

Profit margins can be sustained or even improved over new sales, particularly if performance upgrades can be included in the remanufacturing activity. Customers can then stay up to date with

Figure 2. Remanufacturing Process Diagram
respect to energy consumption, emissions controls or safety systems. In other cases “servicisation” offers remanufacturers an alternative way to compete with low-priced imports. To date, this has largely been a feature of business to business services, where – in general – there is a greater awareness of financial implications of purchasing decisions. Even here, however, there are plenty of opportunities for more informed purchasing based on life-cycle costing rather than “least cost, now”.

From the manufacturer’s perspective, remanufacturing can provide a route to addressing Producer Responsibility demands. The necessary recovery systems are accountable and demonstrably more resource efficient when integrated with the management accounting of manufacturing processes.

“... “servicisation” offers remanufacturers an alternative way to compete with low-priced imports.”

“... remanufacturing can provide a route to addressing Producer Responsibility demands.”

About the Case Studies

The following case studies illustrate both sides of the remanufacturing coin: from the perspective of the remanufacturer, and from that of the purchaser of remanufactured parts.

Caterpillar Inc is a world class OEM and remanufacturer of heavy machinery, with a centre for excellence in Shrewsbury, UK. Sony Computer Entertainment Europe (SCEE) is responsible for the sales, marketing and distribution of Sony PlayStation consoles throughout Europe. They contract remanufacture of their consoles to third party centres, enabling them to provide excellent customer service to end users who have a fault with their unit, whilst keeping the cost of repair to a minimum.

Product-Service Remanufacturers

Rolls-Royce: Power by the Hour

The service concept has been pushed to the extreme for Rolls Royce, the aero turbine manufacturer. Not only do commercial customers demand a round-the-clock, round-the-globe support for their power units, the military do not even own theirs! Rolls-Royce retains ownership of all cores and spares, and charge for usage as agreed with the customer. It is in Rolls’ interest to maximise reuse capability subject to other client constraints. The client is offloaded from maintenance tasks and has a clear view of its future liabilities.

Balzers Tool Bits: Pay per Hole

Tool bit manufacturer Balzers has moved into new ground in the very traditional tooling industry. Tool bits, once seen as a mundane consumable, are now viewed as highly remanufacturable component. Remediation technologies now exist that allow tool bits to be recoated and ground to as-new condition. These are combined with convenient dispenser systems – such as supply and return vending machines, or intelligent hole-count machine tools – at client companies such as Ford. Benefits include improved tool productivity management, overall reduced cost and also conversion of capital cost into variable cost, thus improving cost allocation.
“As good as new, as strong as ever”

Remanufacture at Caterpillar

Who are Caterpillar?

For 80 years, Caterpillar has been building the world’s infrastructure and, in partnership with its independent dealers, is driving positive and sustainable change on every continent.

Caterpillar is a technology leader and the world’s largest maker of construction and mining equipment, diesel and natural gas engines and industrial gas turbines. More information is available at www.CAT.com

• With its head office in Peoria, Illinois, CAT is a truly global company; CAT products can be seen at work in over 200 countries worldwide.

• In 2005, sales outside the US accounted for 53% of CAT’s $36 billion turnover.

• CAT has operations in 40 countries world wide, employing over 95,000 people.

• Its products include track-type tractors, hydraulic excavators, backhoe loaders, motor graders, off-highway trucks, wheel loaders, diesel and natural gas engines and gas turbines.

• Many other manufacturers use CAT engines and systems to power their products.

Business Evolution at CAT

Caterpillar began its remanufacturing business in 1972 following demand from its customers in the US for high quality, low cost replacement engines for their on-road truck fleets. Remanufacturing at CAT has come a long way since then, and now all CAT customers can take advantage of a broader range of remanufactured products in most areas of the world. Always on the lookout to enhance its global position and capabilities, CAT acquired The Perkins Engine Company in 1997, taking over Perkins’ facilities in Peterborough, Stafford and Shrewsbury. Keen to improve access to remanufactured equipment for their European customers, CAT refocused the Shrewsbury operations to remanufacturing in 2004 making it one of four European sites. Shrewsbury is now the remanufacturing centre of excellence for Europe, Africa and the Middle East.

The future is bright. With Caterpillar’s recent acquisition of Progress Rail, a leading provider of remanufactured services to the rail industry focusing on maintaining and servicing locomotives, rolling stock and tracks, Caterpillar has shown that sustainable development opportunities are good business. The Shrewsbury site could now see new business from rail service providers as CAT continues to diversify its remanufacturing operations.
Remanufacturing Services

Caterpillar’s motto for its remanufacturing division is “as good as new, as strong as ever,” and they mean it. Every remanufactured product that leaves the factory has been through a stringent quality test procedure, often having been passed along the same production line as a new product. This is backed up by a full warranty, the same as is issued with a new product.

Figure 3 shows how remanufacture benefits both CAT and its customers. Other original equipment manufacturers (OEMs) wishing to provide remanufactured options for their customers can arrange for CAT to handle the process for them. This has created an entirely new business opportunity for CAT: its expertise in remanufacture allows them to grow the business.

Who buys remanufactured CAT products?

• Large haulage fleet operators
• Defence organisations such as the MoD
• Rail providers
• Mining and quarrying firms
• Agricultural users
• Construction firms
• Marine users
• The list is endless…

Keeping Hold of Core

When a customer purchases a remanufactured part from CAT it is delivered to them in a reusable container, for which they pay a deposit. When returning a worn part (core), customers are expected to use this container. The Shrewsbury site has reduced its wooden packaging waste by 70% using this system, reducing cost and making sure core arrives undamaged. The customer also pays a “core deposit” which is refunded upon receipt of their worn part (provided it is complete and has no extreme damage). The worn parts are then sorted at Shrewsbury and given a basic visual inspection. Some parts will be remanufactured on site and others will be shipped to facilities elsewhere. This process is illustrated in Figure 4.

In 2005 CAT’s global remanufacturing operation reused 43 million tons of core material\(^1\). This means that by remanufacturing rather than recycling, CAT has prevented 52 million tonnes of CO\(_2\) entering the atmosphere\(^2\). It also means that other associated waste due to raw material extraction has been substantially reduced.

Process Simplification is Process Flexibility

The remanufacturing process at Shrewsbury uses patented processes, procedures and tools to dismantle, modify, and reassemble the products. This allows the plant to be flexible in the type of components it

Figure 3. Business Benefits

1 Based on data from the Caterpillar sustainability report 2006. This report states that 61 million tons of product was received for processing in 2005, 70% of which was remanufactured.
2 This is an estimate calculated using data on resource efficiency and greenhouse gas emission produced by the Yorkshire Forward, assuming 100% recycling of parts that were not reused.
can remanufacture. With a skilled workforce, a wide variety of engines (Shrewsbury’s main product) can be remanufactured on site without the need for expensive dedicated lines. Remanufactured products often leave the plant in “better than new” condition, as every part is modified to include the latest design features available at the time for the original specifications to which the product is remanufactured.

Product Improvement

If a part arrives with damage, or is worn beyond tolerance, a cost effective salvage solution will be engineered to restore the product back to as new condition. A number of multi skilled engineers work 100% of their time developing and utilising new processes and technologies. It is true to say that the 6-sigma process engages all employees at the Shrewsbury facility. Using the company-wide 6-sigma process and CAT Production System (CPS), remanufacturing plants like Shrewsbury will continue to strive to improve their material recovery rates and accept a greater range of products.

Investment in Technology

Engineers in CAT remanufacturing facilities all over the world are constantly devising ways of recovering more material from core and this knowledge is then shared with other sites. Even simple solutions such as adding metal inserts to holes
that have been worn over tolerance can greatly improve the recovery rate. The Shrewsbury site has recently invested in a metal spraying machine that can apply a thin layer of metal to restore worn surfaces and allow the part to be reused where it would otherwise have been scrapped. Even with the added expense of salvage, using recovered parts allows CAT to save substantially over using a new part; as much as 90% in some cases, allowing it to pass on further savings to customers.

“... using a new part; as much as 90% in some cases, allowing it to pass on further savings to customers.”

Overcoming Challenges

Table 2 shows the key challenges that Caterpillar have been confronted with and how they have overcome these.

<table>
<thead>
<tr>
<th>Key Challenges</th>
<th>Caterpillar Solutions</th>
</tr>
</thead>
<tbody>
<tr>
<td>How to make sure that core is returned to CAT rather than rebuilt by 3rd parties, who will not have access to the full technical data and test procedures?</td>
<td>The core deposit is set above the market price for the used part so that the customer has an incentive to return the core to CAT. Only CAT remanufactured parts will carry a full warranty and give the customer guaranteed reliability and performance.</td>
</tr>
<tr>
<td>How to gather together sufficient core when a new product is introduced?</td>
<td>CAT will offer customers new equipment at remanufactured process in exchange for used core.</td>
</tr>
<tr>
<td>How to persuade customers that a remanufactured product is as good as new?</td>
<td>The ‘as new’ warranty reassures customers that they will be buying a quality product with excellent after sales support should they need it. Strict quality procedures ensure that the customers experience is trouble free, building trust and confidence in remanufactured products.</td>
</tr>
<tr>
<td>How to find new ways of salvaging more components?</td>
<td>CAT is constantly developing new technology and methods of materials recovery and will continue to do so.</td>
</tr>
</tbody>
</table>

Table 2. Caterpillar Challenges
Sony Computer Entertainment Europe

First Rate Customer Service through Remanufacture

Who are SCEE?

Sony Computer Entertainment Europe (SCEE) is responsible for sales, marketing, distribution and software development for the PlayStation® 2, PSP and PS3 Video game and Multimedia consoles. SCEE has offices around Europe, the Middle East, Australia and New Zealand responsible for the sales and marketing of these computer entertainment systems and associated software to a total of 94 territories.

SCEE import units from its parent in Japan and in turn supply these units to SCE UK, who then sell them to retail outlets. Warranty returns are the responsibility of SCEE.

With over 1000 employees in 11 countries and sales operations in another 91 countries, SCEE is capable of exploiting the opportunities that arise in its existing territories and its emerging markets in Eastern Europe and the Middle East.

In The Beginning...

SCEE has always used a remanufacturing model to enhance its customer service offering. At the launch of the original PlayStation®, SCEE considered the idea to service warranty returns using a traditional repair model, where by returns would be dealt with locally at small Sony approved retailers. The problem would be fixed on site, and parts would have been ordered on an individual basis, with no thought given to recovery of defective parts by the individual repairers, either for reuse or recycling.

This model allowed for little or no quality control, economy of scale, or recovery of potentially valuable parts. It also meant that the repairs would be expensive, with this potential cost being incurred by SCEE. Customers whose unit failed out of warranty would have faced with a hefty bill for labour and parts, as well as a long wait for parts to arrive. This would have put many people off repair, and these units would have been discarded by the consumer, or stored in the attic gathering dust.

However, ideas began to filter through SCEE about how they could radically improve their customer returns model. The mobile phone sector had begun to operate a service exchange policy to reduce the time customers had to wait for a phone to be repaired. This made use of centralised repair centres which allowed for improved quality control and economies of scale. Larger stocks of parts and dedicated lines also meant that turn around time was reduced.

What is a service exchange system?

This is where a customer receives a remanufactured item in place of their own when they return a faulty product. It reduces the time a customer is without a product.

Making a move that took a radical step away from Sony’s traditional model, SCEE chose to abandon
the idea of using localised service centres, opting instead to establish three larger European refurbishment centres and two in Australia and New Zealand which would take in all the units from Europe and

“A This was a conscious effort by SCEE to cut the cost of its service operation and improve customer service, in a market where customer loyalty was vital to the success of the product.”

Australia/NZ respectively. Two of these were Sony operated but ‘Infoteam International Services’ (UK) and ‘UPS Maintenance Partner’ (France) were third party providers contracted to carry out the work. This was a conscious effort by SCEE to cut the cost of its service operation and improve customer service, in a market where customer loyalty was vital to the success of the product.

The Move to Remanufacture

SCEE felt that the faulty modules removed from any returned units must have some value, and so these parts were stored for later use and analysis. After a sufficient amount of experience had been gained at the centres to prove that a remanufactured exchange unit was indeed a better solution to the returns process, SCEE began to look at ways they could increase their efficiency even further.

They soon realised that the faulty modules that had been stored over this period were an extremely valuable source of parts, and set about analysing this stock to establish which systems and components could be salvaged economically for reuse. SCEE then introduced reclamation and reuse to one of its service centres as a test case in 2000. The process was then gradually rolled out over a number of years and by 2004, all service centres were actively involved in reclaiming usable parts.

Over the last 3 years, SCEE has reused over 6.8 million components from both the PlayStation® and the PlayStation2®. These range from screws to expensive processing units and motherboards. These parts would otherwise have been shipped from the Far East, incurring not only purchase cost, but also Shipping and handling costs; instead they were reused predominantly at the centre where they were reclaimed.

Remanufacture comes to the UK

In 1998 SCEE engaged Infoteam International Services Ltd, who were at that point based in Middlesex, to handle all UK console returns. Infoteam have a core competence in remanufacture for electronics companies wishing to outsource their repair operations. Now based in St. Column, Cornwall, Infoteam work together with SCEE and their other European service centres to not only handle returns, but to further develop the process and strive to improve quality.
Innovations to come out of the Infoteam site include the process to age test 100% of remanufactured consoles before shipment to the customer. This reduced the failure rate of remanufactured consoles from 5% to below 1%, a hugely important step for customer confidence and in ‘selling’ the concept to customers of accepting a remanufactured product.

The Returns Process

Figure 5 illustrates the returns process for PS2 consoles.

Why do SCEE use third party service centres?

The service centres do not primarily represent a profit making entity for SCEE; they provide a service to SCEEs customers, SCE UK and the end users. It is therefore in the best interest of SCEE to minimise the cost of the operation. By using a number of third party service partners SCEE has introduced a healthy level of competition between centres, ensuring they will always provide good value for money and reliable service. The potentially difficult political relationship between sister organisations is also removed by the engagement of third parties. SCEE are careful not to work with companies who are also engaged in operations with a direct competitor, this ensures issues of commercial sensitivity are safeguarded.

By spreading the work between different organisations, SCEE gain the benefit of a number of R&D teams, who naturally come up with a range of ideas for process improvement. The best of these can then be rolled out across the entire network of service centres.

There is ready co-operation between engineers at all the sites, enabled by a dedicated technical service extranet, operated by SCEE, which enables all of the engineers and other stakeholders involved with the repair services within the SCEE service partnership network to ask or answer questions regarding best practice posted by others within the network.
Benefits to the Environment

The reuse of components from faulty units has obvious benefits in terms of production, transportation and resource depletion. Although the volume of components reused is impressive at 6.8 million, many of these are very small items, so whilst they are important, the most important environmental benefit lies elsewhere.

The cost to repair of out of warranty units has been made very affordable by SCEE’s remanufacturing operation. Were the cost higher, many end users would opt to purchase a new console, particularly as a model reaches the end of its life cycle and the price of new units falls significantly.

SCEE estimates that around 40% of returns towards the end of a product lifecycle can be attributed to out of warranty units. If they did not offer such an affordable option to customers, these units would likely end up as landfill and be replaced with new. Over the period 2004 to 2006, this would have prevented 3,000 tonnes of CO\textsubscript{2} entering the atmosphere due to UK operations or 13,000 tonnes over the rest of Europe\textsuperscript{3}.

Further gains are made by the centralised collection of damaged units. The service centres can amass large enough quantities of Polycarbonate case components to sell as a feedstock for recycling. This is mixed with virgin polymer and used in mid grade polycarbonate components, such as internal components for photocopiers, pens or even plastic chairs.

Benefits to the end user

- Service replacement scheme means they are without a console for the minimum amount of time. (Typically only 24 – 48 hours in the UK)
- The console is collected from their home, or other choice of address and a new one delivered. There is no need to take the unit to a shop.
- Using economies of scale and the use of reclaimed parts, SCEE have been able to reduce the price for out of warranty repairs to an absolute minimum.
- Customers know that their remanufactured console will have been through a thorough and consistent process, ensuring the highest standards of quality.

\textsuperscript{3} These figures have been calculated assuming 40% of all consoles returned were out of warranty. The mix of "PS2" to "PS2 Slimline" was 1:1. The associated embodied CO\textsubscript{2} for each device has been estimated from data produced by Best Foot Forward for a range of similar devices. The figures in that report have been benchmarked against other computing equipment. [An ecological footprint and carbon audit of digital radio A1 – DAB Acme Digital, Best Foot Forward, 2006]
Conclusions

Our research has shown that remanufacturing is a highly resource-efficient end-of-life activity applicable to a wide range of products. However, the companies that we have profiled here did not undertake remanufacturing for environmental measures: they were driven by the economics of waste and resource management, from which carbon and other benefits naturally derived.

This is typical and rational; remanufacturing will only take place where it is profitable, assists meeting statutory waste, resource and customer support obligations, and is cost effective compared to other disposal options. Further hidden benefits can be unlocked when knowledge of product failure can be integrated into improved product design, further incentivising brand loyalty.

The companies profiled here are global OEMs, well known names in their sectors and in society at large. They have taken different approaches to remanufacture based on the specific characteristics of their products and customers: Size, value, dispersion, utility, and technology change all influence the model of operation and incentivise customers to stay engaged. Caterpillar started as a contract remanufacturer to GM but, recognising the benefits, applied the same techniques across its product range to create a highly controlled CAT Reman brand. On the other hand, Sony has created a tightly-contracted subsidiary to engage competitive third party remanufacturers as its best means of maximising value in the tightly-fought gaming market. Both approaches work in their own context, and this is one of the lessons for would-be remanufacturers.

The case for remanufacturing is as strong now as ever. In particular, the rising importance of CO$_2$ as a marker of accelerating climate change is shifting emphasis back onto energy and material supply chain inputs into manufacturing. Remanufacturing is a proven strategy for reducing these impacts, as illustrated here. The political and shareholder risk ramifications of this mean that prudent businesses ought now to be considering remanufacturing as a business strategy and as a “green” choice for their own purchases. With a shift in government policy increasingly towards product reuse, remanufacturing is also likely to achieve greater recognition with benefits – financial and environmental – to those who can incorporate it into their portfolio.

Further Information
The Centre for Remanufacturing and Reuse, acting with partner Envirowise, is Defra’s point of contact for support for remanufacturing and reuse companies in the UK. For enquiries and more information, purchaser and remanufacturer support, web and phone details are provided on page 2.