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SHOCK AND ORE

The impact of building services on the environment and why engineers must make resource efficiency a priority

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Virtuous circle

Until recently, the design of building services has focused almost entirely on energy efficiency – often to the exclusion of the environmental impacts associated with the other stages of their life.

A new CIBSE guide has been produced in partnership with WRAP (Waste and Resources Action Programme), a company that advises governments and businesses on how to get greater value out of resources. TM56 *Resource efficiency of building services,* aims to help engineers assess the whole-life environmental footprint of materials and products.

Energy efficient products can potentially use more energy in the extraction of raw materials and in the manufacturing process than they save through their operation. Focusing on energy efficiency can also mean turning a blind eye to other environmental impacts, including mining in areas of water stress, extracting and processing scarce raw materials and the release of toxic chemicals at the end of a product's life.

Most studies into embodied energy and environmental impacts concentrate on the building fabric and ignore building services. This seems to be mainly because it is too complicated. However, considering that building services have to be maintained, repaired, lubricated, upgraded and replaced over a 15-20 year life, this seems to be a serious omission, when considering the impact of a building and all materials associated with its construction and operation.

To demonstrate this, an analysis of the University of East Anglia's Enterprise Centre shows that building services make up approximately 5% of initial embodied carbon, and approximately 32% of embodied carbon associated with maintenance, repair and replacement over a 100-year life. It is also worth noting that emissions associated with construction are released into the atmosphere at the time of construction, whereas operational emissions are released in the future, which means there could be opportunities to reduce them – for example, via the decarbonisation of the National Grid.

Of course, the risk at the other extreme is that we pare down use of materials to the point that we compromise operational performance, ending up with products that fail prematurely and are less efficient.

Until now we have largely focused on operational energy use, as it is relatively simple to estimate the efficiency of equipment. It is far harder to determine the constituent parts of a piece of equipment and trace back the related environmental impacts. Finding out what happens during its life – and how it is disposed of – is also complicated. But just because it is difficult should not mean that we do not do it – all it needs is a concerted effort. Let us consider the business drivers: the resource efficient approach to the design and procurement of building services should cut capital costs and price volatility, as well as reduce supply risks.

Then there are opportunities to reduce environmental impacts, including cutting the destruction of ecosystems from mining, and releasing less harmful by-products and toxic chemicals.

The aim of TM56 is to get a better sense of perspective by considering options with both eyes open – one eye on the operational performance of building services and the other on the life-cycle impacts.

David Cheshire, regional director in AECOM's sustainability team

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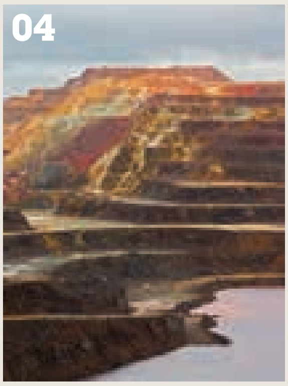

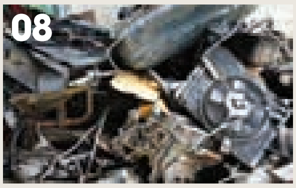

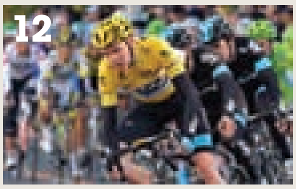

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Copper mine open pit in Rio Tinto, Spain

FIRST STEPS

If the industry is serious about reducing the impact of buildings on the environment, then it must tackle the whole-life footprint of building products. CIBSE's new guide explains the importance of resource efficiency, writes **David Cheshire**

What it means

Resource efficiency in the built environment considers:

- Reducing resource consumption and wastage
- Increasing reuse and recycled content, and enabling reuse and recyclability at end of life
- Matching the durability and lifespan of assets to service life
- Using resources with less scarcity and source-security issues
- Using products with lower embodied carbon, and embodied water
- Reducing energy and water use during construction
- Enabling energy and water efficiency in use.

The use of engineered materials for building services has increased by four to 15 times in the last 50 years. This heightened demand for resources is resulting in price volatility and supply disruption, as well as more intensive approaches to extracting materials and fossil fuels.

A more resource-efficient approach to the design and procurement of building services can cut project risk and reduce the whole-life environmental footprint of products. Impacts can include: the destruction of ecosystems from mining operations; pollution from the release of by-products and toxic chemicals; water stress; and increased energy use to extract resources resulting in intensified climate change.

Informed clients are becoming increasingly aware of resource efficiency and are starting to specify requirements in pre-qualifications and briefs. In particular, clients are asking for more focus on the key issue of embodied energy and carbon as an indicator of the wider environmental impacts of buildings.

What's the problem?

Building services systems typically have a high metallic content with equipment such as boilers and chillers typically comprising more than 90% metal by weight, including steel, cast iron, aluminium and copper. Complex products, such as fluorescent lamps, contain dangerous substances, including mercury and chromium, critical materials, such as palladium and tungsten, and economically

Molten metal poured from ladle into mould

Finished copper pipes

important metals, such as nickel, zinc and aluminium. Rare earth elements are also used as phosphors in lamps and in permanent magnets for motors and drives.

Take copper as a good example of why we have to change our approach.

It is a key metal that is heavily used in nearly every area of building services including: wiring; electronics; plumbing; heating and cooling pipework, as well as heat exchangers in refrigeration. Most copper mining is located in arid areas, putting strain on scarce supplies. The water demand required to extract copper is projected to grow by 45% by 2020 because of decreasing copper ore concentrations[1].

An analysis of the water used to produce important resources identified 10 materials that are generated in areas of high water scarcity and that also require high levels of water use (Figure 1). It is expected that water constraints will limit production in Australia, South Africa, China, India, and Chile. On top of this, climate change is expected to reduce water availability in all these countries, driving price increases for raw materials in the future.

The business case

The business case for resource efficiency of building services focuses predominantly on:

- Reducing capital and life-cycle costs, price volatility and project risk, which helps hedge against future danger of material shortages
- Demonstrating compliance with regulations and standards
- Addressing the project brief or tender requirements.

CIBSE and WRAP to publish new guidance

There is a huge opportunity to use resources more efficiently in the building services industry. An initiative led by WRAP and CIBSE has looked at how industry can minimise the use of precious materials and resources, cut waste and encourage recycling.

A new TM on the resource efficiency of building services will be published in the spring.

Applying resource efficiency can also improve an organisation's reputation, stimulate innovation within the building services industry, and support industry objectives.

An example of the impact of price volatility on building services is the sharp rise in the cost of fluorescent lamps seen in 2011. Manufacturers issued price increase notifications of about 300%[2] because of the global shortage of rare earth phosphors – a critical component in fluorescent lighting systems – and which represent about 50% of the cost of lamps. Figure 2 shows an example of this increase.

The lighting industry has since moved to limit its exposure to such price volatility by reducing its dependence on rare earth phosphors with LEDs now using significantly less of this critical material.

Regulations and policy

Government policy is increasing the emphasis on resource efficiency and the life-cycle of products and services. For example, the *Government's Industry Strategy: Construction 2025*[3] includes an action plan that commits to developing a 'resource-efficient voluntary agreement' and states that: 'improving our understanding of design approaches, including passive design, to balance energy demand and supply in the built environment, is vital in enabling the industry to design and construct high-performance, resource-efficient buildings'.

The Innovation and Growth Team report on Low Carbon Construction[4] recommends that a whole-life carbon appraisal of construction products is taken into account, rather than just considering operational energy.

What is resource efficiency?

Resource-efficient building services make the best use of materials, water and energy over the life-cycle of the equipment, while ensuring that performance is not compromised. (See box 'What it means' on page 4).

The key issues to consider are:

- To identify and reduce materials use and wastage while providing the required functional performance. Changes to the materials used in plant and equipment can adversely affect the operational performance (for example, using smaller cross-sections of ductwork) or can improve both production and operational performance (such as, using lightweight ropes for lifts).
- Ensuring that materials and equipment have a high recycled content is a simple way to reduce the environmental impact of products. Enabling re-use and recyclability at end of life is more difficult and involves designing products that can be disassembled without destruction (see list below), and using materials easily separated that are clearly labelled.
- Building services plant and equipment typically have a maximum life span of 15-20 years with many components replaced during that time span. Most building services impact on the operational energy use of the building, either indirectly (for example

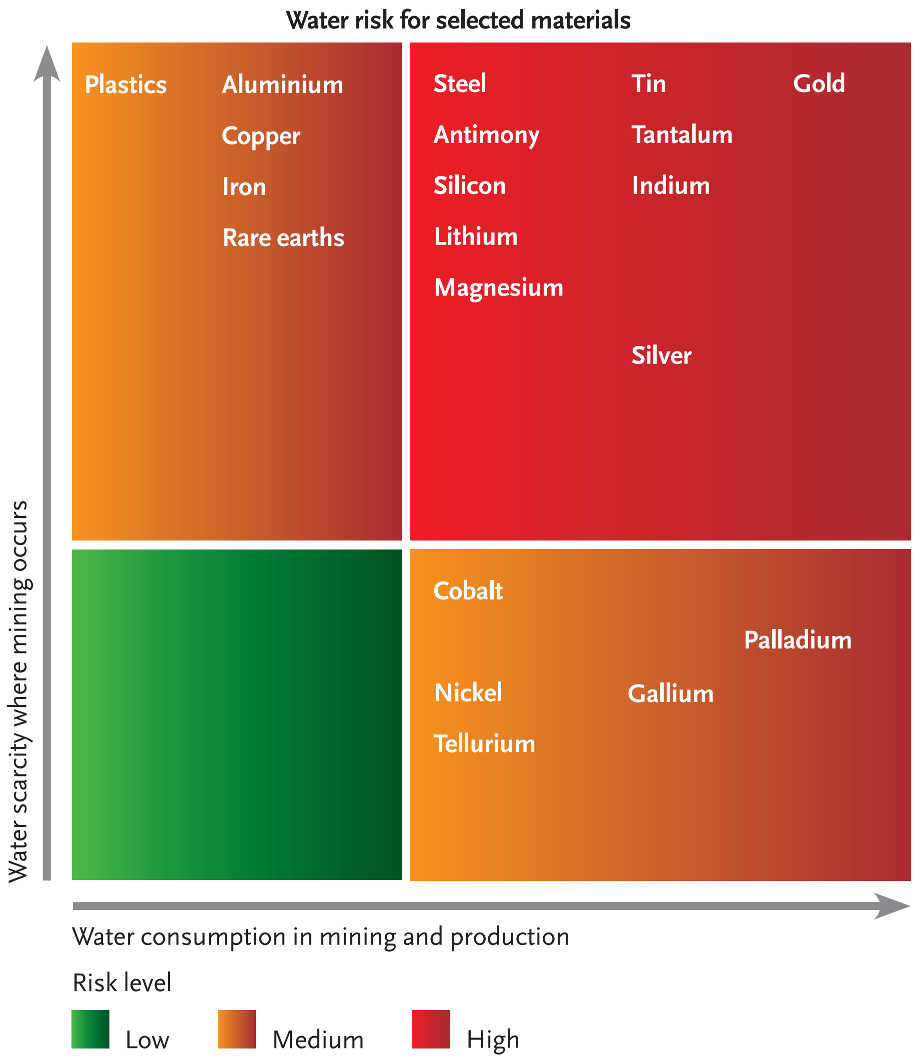

Figure 1: Water risk for selected materials (WRAP analysis)

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> Building services plant and equipment typically have a maximum life span of 15-20 years, with many components replaced during that time span

design of ductwork) or directly by using energy (for example fans). The lifespan of components such as LED lighting far exceeds the expected life of the lighting system and the performance of any systems that are installed is likely to be rapidly overtaken by improvements in energy efficiency. In contrast, the structure and fabric of lifts and escalators typically have a long lifespan with components that are replaced periodically
- Building services use materials that are both scarce and have source security issues
- Building services use high proportions of metals which have high embodied impacts. There are opportunities to use materials with lower embodied impacts particularly in distribution systems such as ductwork and pipework. There is also an opportunity to design out some of the need for building services with the aim of reducing the embodied impacts of the building
- Some building services equipment is modular and designed off-site (such as air handling units and packaged plant rooms). There is the opportunity to expand this modular capability that will help to reduce use of energy and water on site as well as waste.

The ultimate goal would be to aspire to a circular economy where products are kept in use for longer and components and materials then recycled or reused (see *Life goes on* – page 10).

Engineers have the opportunity to increase the resource efficiency of the building services they design and procure. In particular, they can:
- Focus on delivering more resource-efficient building services, including designing out the need for plant and equipment
- Select more resource-efficient equipment by asking manufacturers key questions and selecting plant and equipment on this basis
- Consider upgrading existing equipment during operation and refurbishment, and always weighing up the relative impacts of replacement versus upgrading.

For more on efficient design, see *Lean Machines* on page 16.

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2 *Global Supply of Rare Earth Oxides and the impact on phosphor based fluorescent lighting*, Philips Lighting, 2011

3 *Industry strategy: Government and industry in partnership – Construction 2025*, HM Government, 2012

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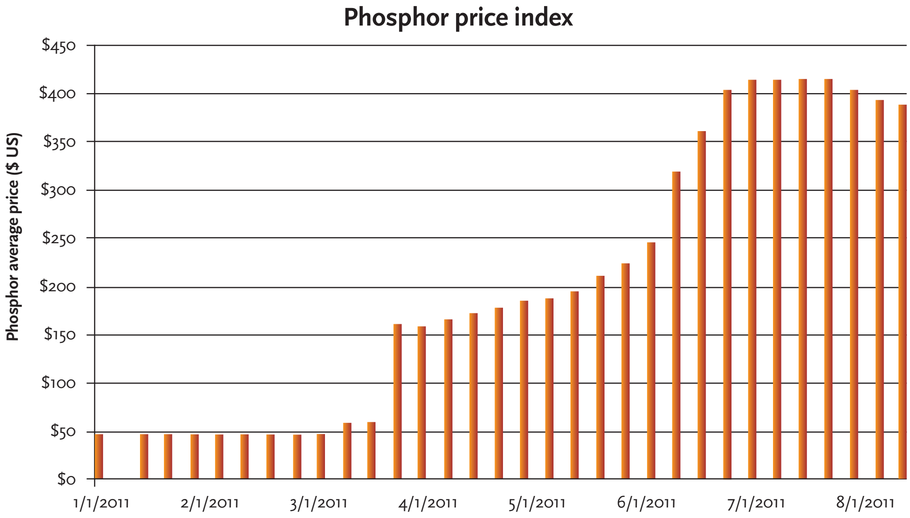

Figure 2: Example of phosphor price index in 2011 (http://philips.to/1eQiio6)

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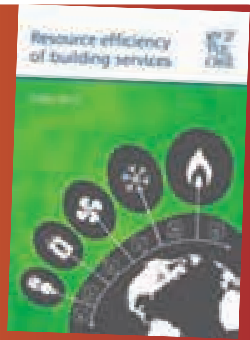
Next steps

There has been limited research or focus on the resource efficiency of building services, in terms of the impacts of manufacturing, construction, maintenance and disposing of the equipment at end of life. After identifying the need for more research WRAP has funded the development of new CIBSE guidance.

The CIBSE TM on resource efficiency aims to set out the current situation and raise the issues relating to this complex subject, rather than providing all the answers.

Initial work shows that there is still considerable research needed to determine:
- A better understanding of the key impacts of building services and, therefore, the main areas that should be focused on (sections 8 to 12 of the TM cover current information available)
- The best way to assess resource efficiency (section 5 covers current methods and tools available)
- How to establish the balance between operational efficiency and other impacts (section 2 of the TM)



LIFE GOES ON

The end of a system's operational life should merely be the start of a new phase. So how can engineers develop a circular economy asks David Cheshire

> Applying resource efficiency can also improve an organisation's reputation, stimulate innovation within building services and support industry objectives

Between now and 2020, 395 m tonnes of potentially recyclable material will pass through England's waste management sector. On current trends, it is expected that only 255m tonnes will be successfully returned to the economy.[1].

The circular economy model is a system where products and materials are kept in use for as long as possible then, after use, they are reclaimed or recycled. Figure 1 shows a comparison between a linear and a circular economy.

The bottom of Figure 1 shows the 'linear economy' model where materials are processed into equipment that is ultimately disposed of at the end of its service life, with only the economically valuable materials being recycled. The top half of the diagram shows the potential to create a more 'circular economy' with higher proportions of resources used for a longer period.

To achieve this new model, the way that building services are designed and procured has to change. Manufacturers need to develop new business models, designers need to set new standards for the products they procure, and clients must drive demand for resource efficiency.

Reducing demand for plant and equipment

The first step is to design out the need for plant and equipment wherever possible. Take naturally ventilated buildings – mechanical ventilation and associated plant, equipment and distribution systems are not required. Of course, this approach can only be applied in certain circumstances and the consequences of designing out equipment have to be considered in terms of operational energy use and the use of the building. More information and examples on designing out equipment are provided in the article *Lean Machines* on page 12.

The next step is to change designs to use fewer materials, improve operational performance and reduce the environmental impacts of the system. For example, lift manufacturer Kone has developed carbon-fibre core rope technology with a high-friction coating that is considerably lighter than existing steel ropes. This saves on embodied energy and operational energy use. Kone estimates that the rope lasts twice as long as a conventional steel rope and does not require lubrication.

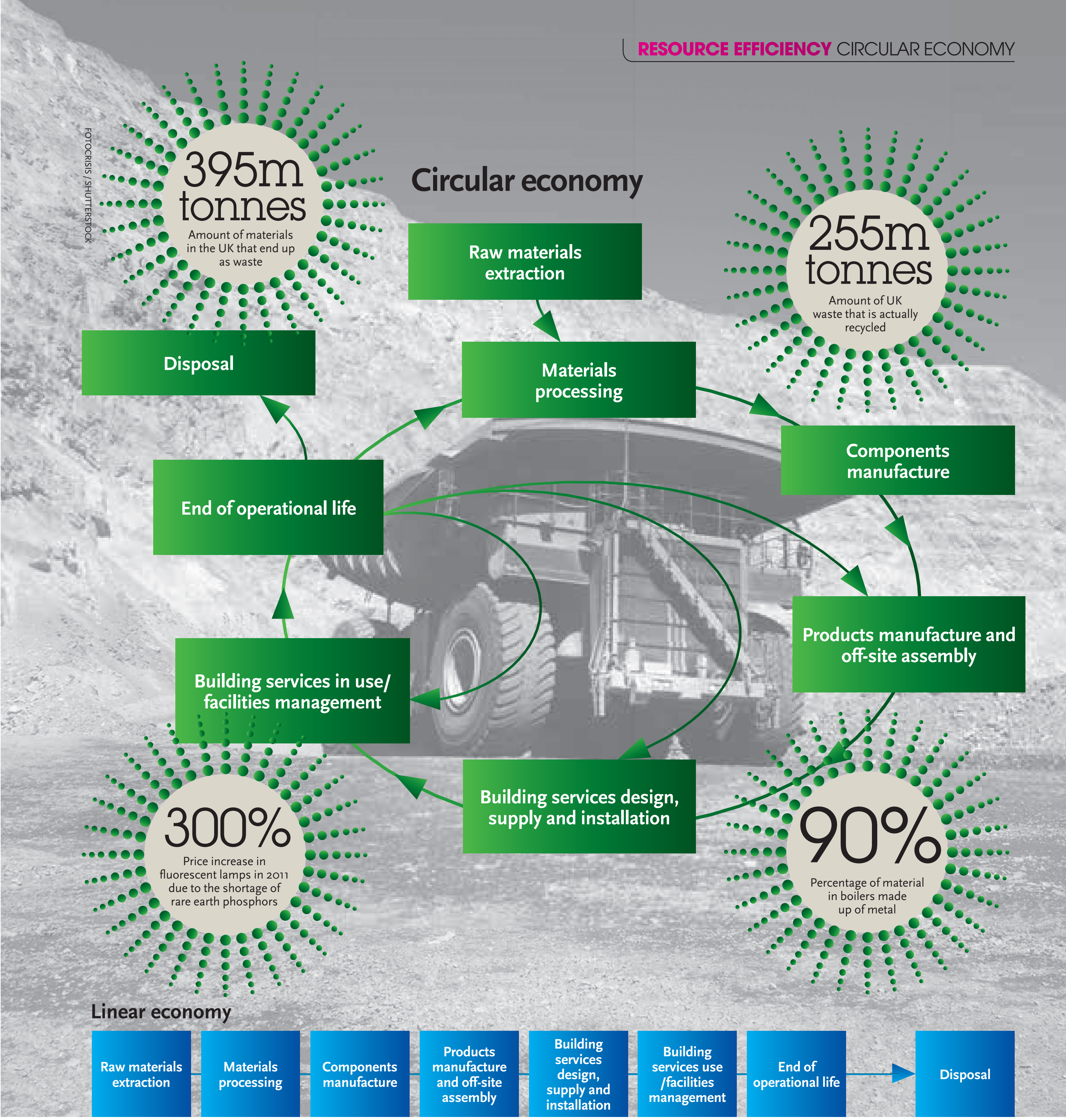
So by removing the need for lubrication, these belts avoid the environmental impacts associated with the use and disposal of lubricants. Kone estimates that this technology is only beneficial for buildings over 200 m tall at the moment, but it is thought that it could be developed for lower-rise buildings.

Leasing equipment or providing a service

Manufacturers could sell products with a contract, such as a lease or a long-term maintenance contract. This should incentivise manufacturers to produce more durable, adaptable and modular products that can be maintained and upgraded to extend their life.

A further development would be for manufacturers and providers to lease products or provide a service instead of selling products. This should encourage a new relationship between clients and providers, where maintenance is included in the contract, upgrades are part of the service and equipment is designed to last or be upgraded and then reclaimed/recycled at the end of its life.

There are some examples of this happening.



For example, Philips developed a 'pay-per-lux' service in response to architect Thomas Rau's request to buy the exact amount of light for workspaces and rooms that his employees needed when using them for specific tasks (see his thoughts overleaf).

This requirement led Philips to tailor the office illumination to the amount of light needed in the space. Maintenance is included in the pay-per-lux service and upgrades are provided by either adapting the existing system or by reclaiming the materials and recycling them.

As with any system where payment is linked to performance, the brief needs to protect quality and efficiency as well as quantity. In the case of lighting, this may include criteria such as colour rendering, angles of light radiation, lamp efficacy, and so on.

Safeguards against premature or planned obsolescence

Many HVAC products have a steel or aluminium structural frame with an expected long lifespan. Attached to this framework are

Figure 1: A simplified comparison of the linear and circular economy models for building services

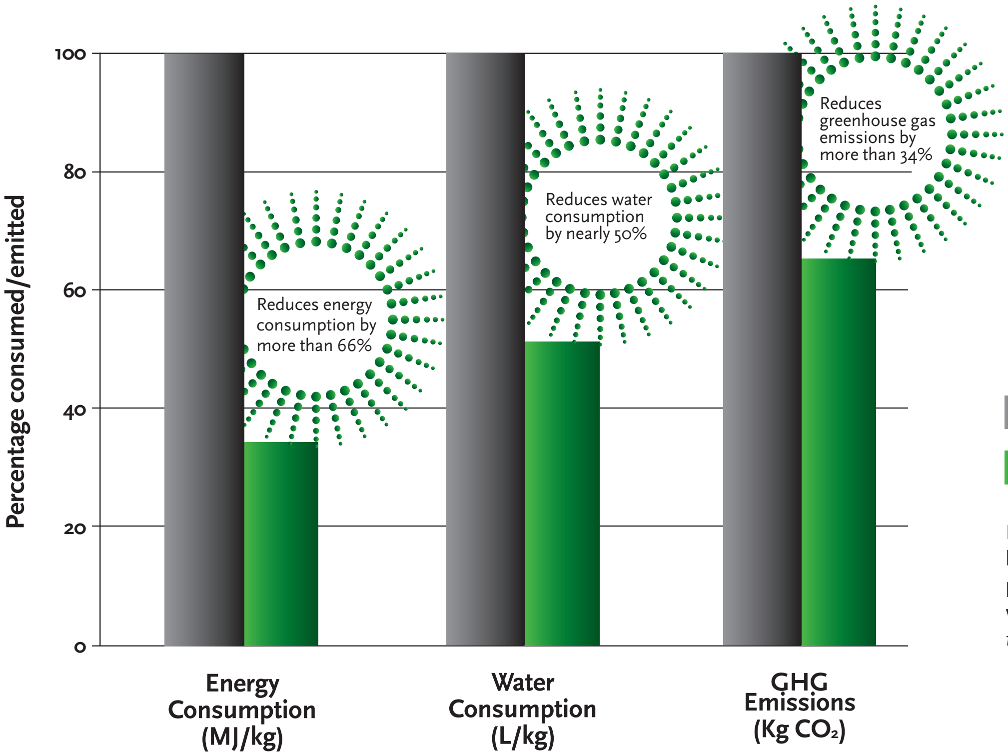


Figure 2: Manufacturer's comparison between virgin natural polyester and polyester using recycled post consumer waste *(Based on published data specific to the Repreve brand for textured polyester yarn)*

I told Philips, "Listen, I need so many hours of light in my premises every year. You figure out how to do it. If you think you need a lamp, or electricity, or whatever – that's fine. But I want nothing to do with it. I'm not interested in the product, just the performance. I want to buy light, and nothing else"

Thomas Rau

CHATCHAI SOMWAT / SHUTTERSTOCK

layers of other components. Some products are designed so that components can be easily replaced, thereby extending the life of the product. Research by the University of Cambridge[3] proposes an 'onion-skin model' to capture this idea and identifies ways to retain the metal-intensive components of the product for longer. The research proposes three strategies:

- Durability – maintaining the original condition for longer
- Modular and adaptable design – to improve on the original design to compete with recent innovations
- Cascade – find new users for the product in its current condition, which may be as good as originally designed, or partially upgraded.

The durability of products can be improved by identifying the likely failure points, designing to delay the failure, and ensuring that condition monitoring becomes part of maintenance programmes.

For example, a number of chiller manufacturers provide ongoing monitoring of their equipment and can provide condition-based maintenance. Some lift manufacturers provide monitoring systems to identify rope wear by sending electronic signals through the carbon-fibre strands on the outer layers of rope. This type of approach could be extended to other HVAC products, particularly if combined with a model to lease equipment.

Procuring products with a modular design that allows for future upgrades would help to extend the life of the structure of the product. For example, air handling units are often upgraded, rather than replaced, with new components included in the existing unit or with inverters added to fans to provided variable speed control. Similarly, lifts and escalators can be upgraded through the replacement of key components such as the control panels, motors and finishes. Figure 3 shows an illustration of upgrade options.

Reusing products in a different location is an additional method for extending the product life. Reusing and remanufacturing products retains far more value than breaking down and recycling them. The option for serviceable HVAC equipment to be reused in a different location is limited by the service life of the product and the available market for reconditioned equipment. There is a market for reconditioned boilers, but limited markets for other equipment.

End-of-life recovery, reuse and recycling

When building services equipment has to be refurbished or removed, it is currently difficult to reclaim the components for future use or recycling. HVAC, electrical and plumbing systems are often entangled within walls, floors and ceilings and require considerable efforts to remove them intact. There is rarely any mechanism for equipment to be returned to the manufacturer for reuse or recycling. However, there are some schemes that could be replicated.

Power and automation technology company ABB has a drive-recycling scheme that uses a certified waste-management company to collect and recycle its drives. Drives are collected through bins sited at the premises of ABB Drives Alliance members. Larger drives or large quantities of smaller drives can be collected direct from the end user's premises[4].

British Gas has set up a contract with logistics company DHL to collect and recycle all boilers and associated systems from domestic boiler replacements. This initiative has halved the cost of boiler disposal through reclaiming the materials and has provided useful feedback on how to design more resource-efficient boilers that can be deconstructed and recycled.

Specifying products with a high recycled content can help to reduce the associated impacts of services. For example, fabric ductwork made from 100% recycled post-consumer plastic bottles has been manufactured by Prihoda[5]. The firm's analysis shows that using recycled materials saves energy, water and greenhouse gas emissions compared with virgin polyester (Figure 2).

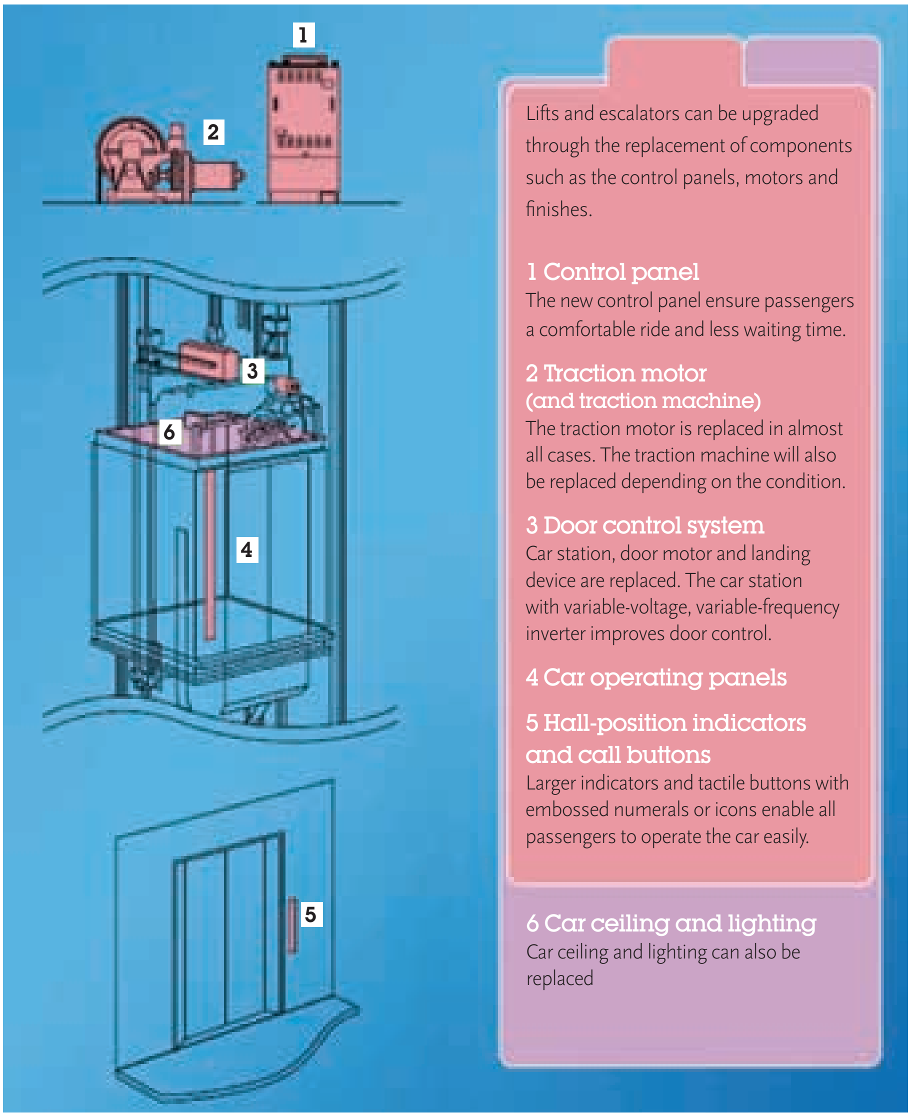


Figure 3: Upgrade options for elevators. Based on: elemotion, passenger elevator modernisation, Mitsubishi Electric, 2009

Conclusion

Implementing a circular economy model in the building services industry would require manufacturers, designers and clients to drive significant change.

Designers can take the lead by:

- Proposing alternative approaches to procuring services (for example leasing)
- Procuring equipment that can have an extended life through conditioned-based maintenance and being designed to allow for upgrades
- Considering alternative products made from more resource efficient materials.

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2 Case study, RAU, Philips, 2012

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4 **http://bit.ly/1eQmwVM** (accessed16 September 2013)

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LEAN MACHINES

We need to design services that deliver longer-lasting solutions using fewer resources. **David Cheshire** sees many opportunities for engineers to be more efficient

It is estimated that 80% of the environmental impacts of products are locked in at the design stage[1]. Although building services have environmental impacts over the whole lifecycle, from materials extraction through to disposal, these impacts are largely determined by the design of the systems and the choice of equipment.

A resource-efficient system would be one designed with fewer resources and using equipment that can be kept in service for longer through upgrades or reuse.

Figure 1 summarises the main opportunities for designers to improve the resource efficiency of building services, alongside examples of how this can be applied when designing a ventilation system.

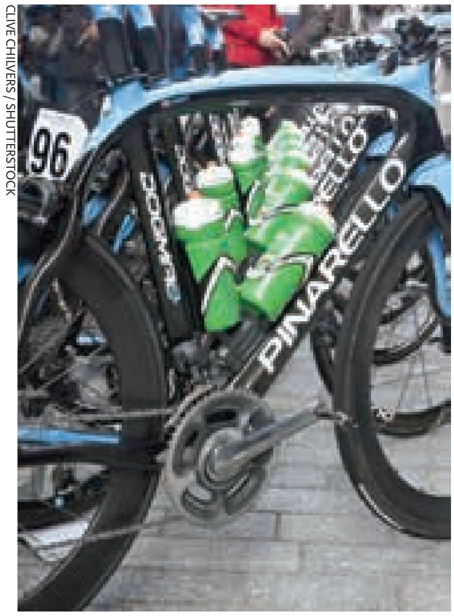
Design out demand

There are opportunities to design out the necessity for building services. The need for mechanical cooling can be designed out through:

- Reducing heat gain to the space by minimising internal heat gains from lighting and equipment, selecting efficient equipment, and locating high heat-gain equipment in a separate space to allow local cooling
- The use of passive cooling techniques, such as night cooling strategies.

Designers should establish the likely peak temperatures without mechanical cooling and the options for using the building form and fabric to reduce the solar gains. The analysis would assess the ventilation rates (natural and/or

Team Sky's professional cycling team is renowned for its attention to technical detail and its philosophy of marginal gains



CLIVE CHILVERS / SHUTTERSTOCK

mechanical) and passive measures needed to meet summer temperature limits.

Challenge the brief

There are opportunities to question and discuss the criteria specified in the project brief as these may not be the most appropriate design criteria, or the client may not appreciate the implications of setting the standards.

Equally, best practice guidance can be applied to calculations to ensure the design provides only the services necessary to meet demand.

For example, the SLL Code for Lighting[2] states that broadly applying the same illuminance levels to a whole floorplate would be wasteful in terms of the amount of light actually required. It says that, when faced with a list of requirements, 'it may be tempting for the lighting designer to just put 500 lux everywhere on a plane parallel to the floor at desk height, safe in the knowledge that all requirements will be met or exceeded. However, this approach is highly wasteful and may well result in an unnecessary increase in energy consumption of more than 50%'.

This increase is associated with the installed capacity of the lighting equipment, meaning more luminaires and more lamps would be installed. Using less equipment would:

- Reduce the resources required to manufacture the equipment
- Cut the number of lamps requiring maintenance and replacement
- Lessen levels of residual waste at the end of the system's life.

> Designers should undertake an analysis to establish the likely peak temperatures without mechanical cooling and the options for using the building form and fabric to reduce the solar gains

Figure 1: Opportunities for resource efficiency in building services (examples in right-hand column)

Design out the demand for services	**Considering natural ventilation system to reduce the amount of mechanical ventilation**
Challenge the brief and use best practice design calculations	**Carefully calculating the design air volumes and external pressure requirements to optimise design**
Optimise system design	**Taking an integrated design approach to ductwork design to reduce the amount of ductwork required and reducing the pressure drop**
Consider alternative materials	**Consider alternative materials for ductwork, such as fabric ductwork**
Select resource efficient equipment	**Specifying equipment with good environmental product declarations**
Consider re-using existing systems (refurbishment)	**Assessing the opportunities to re-use existing ductwork and AHUs when refurbishing buildings**

> There are alternatives to galvanised steel ductwork, including lightweight products made from fabric and even cardboard

Optimise system design

Ductwork is a major component of ventilation systems and is typically made of steel, which has a high embodied energy impact.

If the aim is to improve resource efficiency, building design has to allow for the effective integration of the ductwork at the early stages. The constraints imposed by the building and the siting of fans, plant items and terminals can lead to an overall duct layout that is not ideal.

Ductwork design should consider both strategic and detailed issues. These include:

- Rationalising the area of the building that has to be mechanically ventilated and using natural systems where applicable
- Locating the air handling unit as close as possible to the ventilated space in order to minimise the length of the ductwork run
- Using local extraction by the appropriate location of plant to minimise duct runs
- Minimising the number of fittings possible to reduce embodied energy, materials use, cost and pressure loss
- Ensuring ductwork is sealed to minimise leakage – this allows reduction in both equipment and ductwork size
- Employing circular ductwork where space allows to cut the amount of material required
- Reducing unnecessary pressure drops in the system by carefully sizing, routing and detailing ductwork.

Alternative materials

There is the potential to use alternative materials for some building services components to reduce the lifecycle impacts. Of course, when considering alternative ductwork materials, other design factors need to be considered, such as acoustics and fire rating.

In particular, there are alternatives to galvanised steel ductwork, including lightweight products made from fabric and even cardboard.

Fabric ductwork can be applied in a range of buildings, including swimming pools, laboratories, classrooms and offices. It comprises considerably less material, and therefore less embodied energy impact than metal ductwork. For example, fabric is less than 10% of the weight of the galvanised steel per unit of surface area.

Tri-wall cardboard ductwork has been developed[3], which has a coating made from a water-based solution with a water dispersal polymer, fire-retardant minerals and a final hydrophobic finish. The coating can be recycled with other water- and oil-based printed paper. The cardboard is high strength and can be recycled into other substantial products. Additional benefits of cardboard ductwork include the need for less insulation than steel ductwork, as it has some insulating properties.

The weight of the cardboard ductwork is 1.95kg/m^2 surface area – approximately 20% of the average weight of galvanised steel. It is roughly the same percentage in terms of embodied energy, although this is harder to calculate until a life-cycle analysis is completed.

Lightweight ductwork cuts transport costs and emissions, and those that can be flatpacked have an even smaller environmental impact.

Of course, using different materials for ductwork could increase the pressure drop of the system. Therefore, any decisions about using alternative materials have to be informed by a simple life cycle assessment to ensure that reducing embodied energy impacts does not have an adverse effect on the operational performance.

Selecting the right equipment

When selecting equipment, the impacts of the whole life-cycle need to be considered. Designers should ask manufacturers for information about their products and determine whether they have considered the impact of manufacture and disposal, as well as operational impacts.

Some manufacturers have prepared Environmental Product Declarations (EPD) that set out the impacts of each stage of the product's life. The impacts include:

- Resource depletion – the use of non-renewable mineral resources including those used for energy (oil, gas, coal, and so on)
- Acidification potential – the likelihood for the product to contribute to acid rain
- Eutrophication potential – the product's

Prihoda's fabric ductwork made from 100% recycled plastic bottles (left) and Gatorduct's cardboard duct (right)

contribution to water or soil nutrients that cause algal blooms
- Global warming potential – the emissions of carbon dioxide or methane that affect the Earth's atmosphere
- Photochemical ozone creation potential –the contributions to smog caused by hydrocarbon emissions.

These EPDs can be used to determine whether products have adverse impacts, and can be used as a product comparison tool as they become more widely adopted.

As an example of effective comparison, a study by Defra (cited in a European Commission[4] report) compared the lifecycle impacts of six types of lamps: incandescent (GLS), compact fluorescent (CFL), linear fluorescent (T5), ceramic metal halide (CMH), integrally ballasted LED (Int-LED) and dedicated LED luminaire.

This analysis shows that T5 linear fluorescent lamps had a lower environmental impact than the LED lamps when the study was carried out in 2009. The research considered the potential reduction in environmental impact of an LED lamp in 2017 and showed that the overall impacts could be one day lower than linear fluorescent.

Designers can also ask manufacturers about the recycled content of their products and whether they are designed for disassembly to allow them to be upgraded, reused or recycled, rather than being disposed of at end of life.

Reusing existing systems

The refurbishment of a ventilation system should consider:
- Surveys and investigations to establish current and likely demands
- An assessment of the operational energy performance of the existing system compared with current available technology
- The feasibility of reusing or refurbishing the existing system
- Replacing components rather than the entire system to improve efficiency
- Sizing equipment as per the best practice industry guidance (rather than like-for-like replacement)
- Procuring any new (or refurbished) equipment using the principles set out above

When refurbishing a building, the condition of the existing system should be assessed to determine opportunities for reclaiming components for reuse. For example, lifts and escalators typically have a long life and various elements,including control systems, drives, door systems and finishes can all be refurbished over the life of the equipment.

The benefits of refurbishment over complete replacement should be considered in terms of the expected future lifespan and the performance requirements. Manufacturers and specialist companies offer services to modernise existing systems, ranging from simply refreshing the finishes to replacement of major equipment and control systems, such as the traction machine.

Other equipment that can be replaced includes the control panel, landing device and terminal stopping device. Car operating panels, travelling cables and door operators can be retained for further use.

Conclusion

The opportunities for designers to influence the resource efficiency of projects are far-ranging – from fundamentally redesigning the building or system, through to specifying alternative materials or selecting manufacturers that have considered the environmental impact of their products. The whole industry, including clients, designers, contractors and manufacturers, has to be involved in improving the resource efficiency of building services. Designers should seize the opportunity to take a lead by starting to raise this issue right at the start of projects.

References

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