Emissions saved - transport = waste footprint

Transport = distance x carbon intensity

Making waste add up

Will Simpson learns how SITA calculates the CO_2 produced by different waste disposal routes

Aluminium = 2 tonnes

In October 2012, *the environmentalist* looked at how Newcastle Hospitals NHS Foundation Trust brought together a number of waste contracts and issued a single new tender for services that included a number of specific environmental requirements (environmentalistonline.com/dixon). Some of these conditions were fairly commonplace, increased recycling rates, for example; others were not.

After much deliberation, it was SITA that won the contract, partly because as James Dixon, the trust's waste manager explains, every other company tendering admitted they would not be able to provide the necessary data or in the precise format demanded by the trust. "SITA was the only firm that came back to us and was able to say 'you emit 0.8 tonnes of CO_2 per one tonne of waste that you send to our energy recovery facility' and then compare it to what emissions would be if sent to landfill," says Dixon.

1 tonne of virgin aluminium = 10,488 tonnes CO_2

Emissions data was the detail that the trust was seeking; a way that it could accurately compare how different waste routes are performing in terms of saving carbon and show, in easy-to-understand terms, what differences its efforts to reduce waste are making.

Carbon calculator

The secret resides in the carbon calculator that SITA began developing around 2007. This is a mathematical formula that measures how much CO_2 has been saved by diverting waste from landfill into other disposal routes. In the case of Newcastle Hospitals NHS Trust, these include an energy-from-waste plant and an anaerobic digestion facility.

"What we do is look at the fates of the different materials," explains Stuart Hayward-Higham, development director at SITA UK. With materials that are recycled, for example, the firm compares emissions savings made by recycling the waste rather than sending it to landfill, and then calculates the additional carbon saved by preventing new materials, such as virgin aluminium, from being produced.

1 tonne of recycled aluminium = 1,222 tonnes CO_2

"Meanwhile, for RDF [refuse-derived fuel] or the energy-from-waste solutions, we look at the carbon intensity of the treatments. If the RDF is sent overseas, it is generally to plants that are a lot more efficient in their energy use than in the UK," says Hayward-Higham.

He explains that the main difference is not the equipment or the facilities, but that in Europe using heat from energy plants is common practice – through heat grids and suchlike – so a lot more of the energy is being used. "Although shipping and transport adds a burden, the benefit we get at the other end more than compensates for that," claims Hayward-Higham.

SITA looks at the fate of all the different material that it collects, then uses the Defra guidance on measuring greenhouse-gas emissions or the Environment Agency's waste and resources assessment tool for the environment (WRATE) – software that compares the environmental impacts of different municipal waste management systems – to calculate the carbon intensity of each solution.

No easy task

Working out the carbon intensity for each stream is not straightforward, however. "In principle, we would need to calculate the carbon burden of the waste receptacle, ie the bin, including maintenance cost, expected life and ultimate fate, the truck collecting the bin, and the facilities treating the waste," says Hayward-Higham. "Then we'd have to assign a proportion of the carbon capital to each collection."

The firm would also have to assign each customer with a calculation for bin collections based on the miles travelled, the mix of waste collected and the burden of sorting and separating. Then, for each new stream created, it would have to establish a measure for its transport and for the benefit/burden of its ultimate fate.

"But that's not really possible at the moment as the trucks will collect and consolidate a number of customers' bins and we won't be able to sort and separate the bin contents prior to mixing in the truck or follow the contents through the chain of treatment," acknowledges Hayward-Higham.

He explains that SITA is currently working on a method to collect data from the vehicle round – the whole journey plus the sum of bins collected – as well as information collected over time from customers' bins and site audits that will enable the firm to estimate the average contents of clients' bins. "That composition, plus the weight of each bin collected, will provide us with the data we'll use to define the volume and composition of

Emissions from virgin materials (21,000kgCO_2) – emissions from recyded (2,500kg CO_2) = 18,500kgCO_2 saved

the customer's waste/commodity stream," says Hayward-Higham. He says the formula itself is not difficult and uses the example of aluminium to demonstrate how it works: "You take the amount of aluminium collected, then apply the Defra or WRATE metrics, which enable you to calculate the amount of carbon saved compared to using virgin aluminium, giving a total cost."

To calculate the transport emissions involved, SITA tots up the number of miles the ship, for example, travels, and applies a measure for the carbon intensity per mile travelled. "Then you subtract the burdens from the benefits, which gives you a net result," he explains.

Standard practice?

As SITA uses accessible metrics from both Defra and the agency, it seems likely that other waste contractors could easily arrive at the same figures. "There's no reason why anybody couldn't do it, be it a waste company, a consultancy or a hospital itself. It's just about tracking your data," says Hayward-Higham.

It is a more difficult calculation if a waste company uses another's facilities and has little control over final disposal, particularly where the waste is recycled, however. SITA occasionally makes uses of other companies' waste management facilities for some streams and needs to understand the whole process chain from recovery to how the recycled products are used.

"We are reliant on them and the companies which ultimately use the recycled materials to provide data. But ultimately for an individual customer, their contribution to tonnage will be small and we therefore use industry average burdens/benefits for the individual streams," explains Hayward-Higham.

More than carbon

Carbon is not the only thing that the SITA calculator can measure. The waste management company can also track: energy savings; toxicity; and land usage/land saving resulting from different waste streams.

"Measurements of these aspects are a combination local information, such as plant, truck, and region or commodity stream average data. And we look at recognised data sources for those elements we cannot measure directly," says Hayward-Higham.

He is confident that SITA will soon be able to map out other environmental impacts using the same metrics. "We're becoming more detailed and I suppose a bit more bespoke," he says. "We're currently working on the next generation of carbon models, which will also calculate water savings."

Hayward-Higham points out that recycled materials not only save carbon, but have much wider impacts. "Take a pair of jeans, for example. All the water that you need to grow the cotton, manufacture the material and then prepare the jeans is saved if you recycle them. And this can be measured, again using either Defra or other environmental statistics," he says. "The same goes for cardboard and land use. You can calculate how much land you are saving by recycling one tonne of cardboard by measuring how much land is dedicated to growing the trees that produce one tonne of virgin material.

"What we're trying to do is move the debate on. Carbon is very important, but it's not the only thing that's important. Other wider environmental benefits should also be accounted for."

1 tonne of new clothing = 22,310 tonnes CO_2

Not just a number

One of the motivations behind SITA's work in this area is to ensure the issues of recycling and energy use are more than just a set of numbers on a spreadsheet.

Since the start of the contract with Newcastle Hospitals NHS Trust in January 2011, SITA has helped the organisation to more than triple its recycling rate, from 9% to 30%. That has had a real impact on staff at the trust. "It is about making the whole thing more tangible for people," Hayward-Higham insists. "I think in any tender we try to provide a picture of what we're offering in more than a monetary sense. That means giving them a sense of what they're saving in terms of carbon and other factors so that they know the value of what they're achieving with the work they do."

Key to this is engaging workers, he says, so they can appreciate why recycling is worthwhile. "Generating understanding means we can have an informed discussion about what the organisation can achieve."

1 tonne of recyded plastics = 1,977 tonnes CO_2

It seems likely that other waste companies will be – if they're not already – following SITA's example and providing more detailed and accurate information for large waste contracts. There is also the potential to use similar calculations for the waste from small businesses and domestic householders. Hayward-Higham points out that the potential is there: "Technically, we can already do that. We can weigh the bins as we collect them, we can tag them and know which bins belong to which house. If domestic customers become comfortable with it and they like the idea, then there's no reason why it couldn't happen."

Certainly Dixon at Newcastle Hospitals NHS Trust suspects that other public bodies will be asking for the same sort of detailed data before too long. "I had an enquiry from Northumbria Healthcare, which was doing a waste tender at a similar time and had heard about what I'd specified in our contract. I'm also aware of some trusts in London that, while they aren't necessarily putting a requirement for such calculations in their specifications, are obviously working with contractors to get better data," says Dixon.

"I hope these methods become more widespread, because they've made such a difference on the ground for us," he says. "Previously we were really operating with our eyes closed. For me it's a great benefit because I can see which areas are not performing very well. I can identify the hotspots that need improving, which we couldn't really have done before."

1 tonne of new plastics = 3,179 tonnes CO_2

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