

## PAVEMENT TREATMENT EMBODIED CARBON TOOLS (PROTECT)

The ProTECT suite has been designed and developed by the RSTA with The University of Nottingham to provide members and interested parties with easy-to-use, PAS 2050 compliant, carbon calculators for seven RSTA products. The products considered so far have been: Surface dressing; Slurry/Micro surfacing; Mechanical retexturing; Infrared patching; Velocity patching; and hot and cold applied high friction surfacing.

The worked example below will show how the tools can be used to produce a job specific embodied carbon figure. The tools are also useful for generating annual carbon usage figures and for comparing different options on a job.

### WORKED EXAMPLE

A slurry surfacing job has been chosen for the case study to show the full capability of ProTECT. The job is to lay a total of 100t of material at a site 100miles from the company depot. The mix design (by weight) is:

- 85% Aggregates
- 10% PMB
- 1% Cement

Due to investigations done during the development of the calculator, only the aggregates, bitumen and cement/lime need to be considered for a carbon calculation of slurry/micro surfacing.



### BUILDING THE DATABASES

The first stage of using ProTECT is to build up databases of materials and plant that are used on site. There is also some supplementary 'Other Data' to add. This stage will need to be done initially but then only needs to be reviewed on a yearly basis or if there is a major change to a material, a piece of plant or operating practice.

#### ADD MATERIAL

The 'Add Material' screen (Figure 2) is navigated to from the 'Home Screen'. Here the details of the materials being used are entered for use on future projects. Materials can either be entered using 'default' embodied carbon figures included in ProTECT or by using 'known' figures from suppliers or previous studies. The materials and their properties entered for use on this case study are detailed in Table 1.

Figure 1: Add Material Screen

Table 1: Material Properties

Material	Material Type	Residual Bitumen (%)	Distance Transported to Depot by road (miles)	Vehicles return full?	Vehicle Type	Average Weight Transported (t)	Proportion of Vehicle (%)	Distance Shipped (miles)	Gross weight Shipped (t)
Aggregates	Coarse Aggregate		100	Yes	>33t Artic	32	100	400	1000
PMB	PMB	60	250	No	>3.5-33t Artic	20	100		
Cement	Cement		15	No	>3.5-7.5t Rigid	1	100		

## ADD PLANT

Plant is entered in a similar way to materials. Details of travel and operational fuel efficiencies are entered for use in future job calculations (Figure 3). The plant and their properties entered for use on this case study are detailed in Table 2.

**Table 2: Plant Properties**

Plant	Travel Fuel Type	Efficiency (miles/litre)	Operation Fuel Type 1	Efficiency (litres/t(laid))	Operation Fuel Type 2	Efficiency (litres/t(laid))
Paver			Diesel	0.5	Diesel	0.7
Lorry	Diesel	4				
Van	Petrol	10				

**Figure 2: Add Plant Screen**

## ADD OTHER DATA

'Other Data' is the supplementary operating data concerning the embodied emissions inherent in offices, warehouses and other company buildings. The data entered for this case study can be seen in Table 3.

**Table 3: Other Data**

Material Laid per year (t)	Electricity used per year (kWh)	Proportion for Slurry (%)	Water used per year (L)	Proportion for Slurry (%)
11000	39000	100	97060000	100

**Figure 3: Other Data Screen**

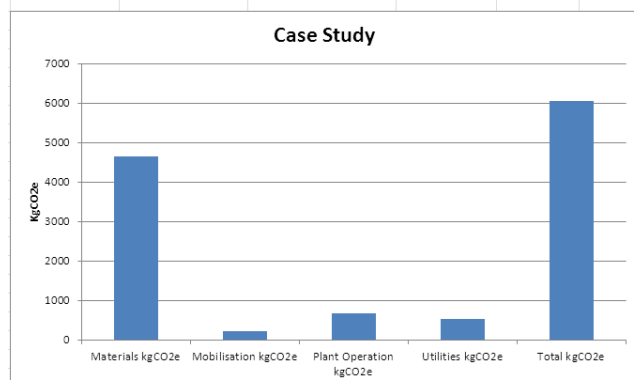
## JOB CALCULATION

Now the databases have been populated the case study job calculation can be done. Details of the job are entered via the 'New Project' screen (Figure 5). Mix designs, travel distances and operation quantities are entered for each piece of plant. The data entered for this case study is shown in Table 4.

## RESULTS

Results from the case study can be seen in Figure 6. The results are broken down into different categories to aid comparisons and finding possible reductions. In this example it can be seen that the materials contribute the majority of the footprint and so possible reductions might be found in sourcing closer or recycled materials.

Materials kgCO <sub>2</sub> e	Mobilisation kgCO <sub>2</sub> e	Plant Operation kgCO <sub>2</sub> e	Utilities kgCO <sub>2</sub> e	Total kgCO <sub>2</sub> e	kgCO <sub>2</sub> e/t
4637.43	216.33	681.44	520	6055.2	60.55
76.6%	3.6%	11.3%	8.6%		



**Figure 5: Case Study Results**

**Figure 4: New Project Screen**

**Table 4: Job Data**

Plant	Paver	Lorry	Van
Material 1	Aggregate		
Proportion (%)	85		
Material 2	PMB		
Proportion (%)	10		
Material 3	Cement		
Proportion (%)	1		
Distance driven (miles)		100	100
Distance Driven around site (miles)			10
Material Laid (t)	100		
Material Used With (t)		100	100

## FURTHER INFORMATION

Further information and copies of the ProTECT suite can be obtained from the Road Surface Treatments Association;  
[enquiries@rsta-uk.org](mailto:enquiries@rsta-uk.org), [www.rsta-uk.org](http://www.rsta-uk.org)