



Whole life cost and total cost of ownership

Introduction

Whole Life Cost (WLC), also known as Total Cost of Ownership (TCO), is the cumulative cost of owning and operating a piece of equipment throughout its entire lifecycle. This includes not only the initial capital costs of acquisition, whether by purchase or lease, but also the ongoing operational expenses associated with its use.

Transitioning to a decision-making process that considers the WLC of an asset may represent a significant shift in behaviour, yet it is an essential stride towards adopting a sustainable system. Typically, options that are more sustainable – whether they are made of ethical materials, have lower energy consumption, or feature components that are replaceable and repairable – generally carry a heftier price tag upfront but offer reduced operational costs over their lifespan.

For instance, when selecting a new washing machine, a more sustainable choice may use less water and energy per cycle, offering the same or enhanced performance with lower running costs. This model, however, is likely to have a higher initial purchase price compared to a less efficient counterpart. WLC analysis allows us to calculate the number of washes required to recuperate the difference in purchase cost, providing a clear indication of whether the investment is justifiable over the machine's expected operational life.

It's crucial to note that while WLC inherently focuses on cost metrics, it does not inherently account for environmental considerations. It is possible to include a shadow price for carbon within the WLC calculation, and this can add an element of environmental impact assessment into procurement decisions

(further information can be found in our technical advice note 'Placing a value on carbon'). This enables a broader evaluation of purchases, considering both their financial implications and their environmental footprint.

Importance of whole life cost

In the past, when the choice of vehicles was largely between diesel and petrol models, purchasing decisions hinged on the upfront cost of buying or leasing, since operational costs did not differ much between models. Now, with a variety of propulsion options available, including battery electric vehicles (BEVs), compressed natural gas (CNG) vehicles, and fuel cell electric vehicles (FCEVs), it is important to assess costs comprehensively, considering the WLC of each vehicle individually.

Take, for example, the comparison between a petrol car and a BEV. The BEV generally comes with a higher initial price or lease cost compared to a petrol car, but it tends to be cheaper to run due to lower energy and maintenance expenses (less moving parts). This means that a WLC comparison between a petrol car and a BEV will present a different financial picture than simply comparing purchase or lease prices. Additionally, BEVs do not suffer from a decline in emissions standards that affects older petrol vehicles, allowing them to last longer without detriment to air quality. In fact, as the electricity grid decarbonises, the emissions caused by using BEVs will decrease, without needing to alter the vehicle in any way.

Shifting to a WLC framework for vehicle purchasing calls for a change in both behaviour and budgeting. Traditional vehicle budgets are often structured around low initial



costs but high annual running costs. In contrast, adopting BEVs would mean planning for higher initial costs but enjoying lower operational expenses in the long run. It may take a few years for the benefits of these lower running costs to become apparent across an entire fleet.

Calculating whole life cost

WLC calculations need to be based on the time a vehicle will be kept on fleet, and the expected mileage over that time. In the following table we have summarised the elements to account for within a WLC analysis for a vehicle.

WLC element	Notes
Purchase cost	If purchasing, with varying discounts and schemes available, the actual purchase price paid may differ from the list price.
Resale value & depreciation	If purchasing, the depreciation is the difference between the purchase cost and predicted resale at end of ownership.
Lease rental	If leasing, include any deposit amount paid upfront.
Vehicle excise duty (VED)	Also called vehicle tax, will be included in a lease rental.
Fuel/electricity	Expected fuel or electricity costs over the total lifetime mileage.
Maintenance	Cost of servicing, maintenance and tyres, may be included in a lease rental.
Taxation	The level of tax will depend on whether this is a business or personal vehicle, and if business whether it will be used for private mileage as well.

The following table presents a simple worked example for a small car, comparing petrol and battery electric over an 8-year purchase and 10,000 miles per year, starting in 2023. Costs used are for illustration only. Because BEVs are simpler and have less components than ICE vehicles, the whole life maintenance costs will be lower, however there may be a slightly higher tyre cost due to wear.

WLC element	Small hatchback - petrol	Small hatchback - electric
Ownership lifetime	8 years	8 years
Annual mileage	10,000 miles/year	10,000 miles/year
Purchase cost	£23,500	£29,500
Resale price	£5,000	£8,000
Capital Cost	£18,500 WLC	£21,500 WLC
Insurance cost	£600/year - £4,800 WLC	£700/year - £5,600 WLC
Maintenance cost	£800 WLC	£600 WLC
Taxation (VED)	£140* + £140/annum	£0 + £140/annum from 2025
Fuel type	Petrol	Electric
Fuel cost	£1.55/litre	£0.27/kWh
Energy efficiency	50 mpg	4 miles/kWh
Fuel/energy use	910 litres/year	2,500 kWh/year
Fuel/energy cost	£1,410/year - £11,280 WLC	£675/year - £5,400 WLC
Whole life cost	£36,640	£33,940

**This value is for a vehicle with emissions between 101-110 gCO₂/km.*

In this worked example, we have not accounted for any future price changes, such as inflation, changes to fuel/electricity prices, or mileage changes. It is very difficult to predict how some of these future costs will change, as prices can vary depending on supply and demand, changes in legislation, and national or international politics. Your organisation can improve the certainty around electricity pricing by installing your own solar photovoltaic (PV) generation. Oil prices are likely to remain volatile due to the trading systems in place globally. In estimating costs over a long time, there are inherent uncertainties, which we can only respond to with the best available information at the time. Often, taking no action is seen as the lowest-cost option, as it generally requires no upfront cost. However, when the no action option leads to greater operating costs, this can lead to higher costs on a WLC basis, and a worse situation overall.



Summary

Using WLC as part of the decision-making process in purchasing is an important part of moving to a more sustainable system, as most often the more sustainable option will have a higher upfront cost but lower running cost, when the traditional mindset has had a focus on lowering upfront costs. This mindset can be applied to numerous purchase decisions, whether in a personal or business context.

In the context of vehicles, the economic viability of zero emission vehicles will greatly depend on the amount of mileage driven, and how long the vehicle is kept for. BEVs can be kept for longer, with lower running costs, but your organisation will need to consciously decide that this change is acceptable. Establishing behaviours based on long-term thinking, such as using WLC for purchasing decisions, is a vital part of the system change needed to tackle the climate crisis.

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