

Why Morgans are Green

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It may come as a surprise to many environmentalists, but sports cars have the potential to be among the greenest of cars. One reason is that in order to optimise their performance, many sports cars are designed and built on the principle of weight reduction. This is not normally the case for saloons, however sporting they may be. Indeed, sports cars in general are far more built to purpose than typical hatchbacks or saloons that, as a result, are generalist vehicles that are competent in many areas but excel in none. It is even possible nowadays to engineer a large 4x4 car that performs like a sporty car, at least in some respects, but such performance comes with excessive environmental cost. One of the best companies in terms of designing and building fit for purpose sports cars is the Morgan Motor Company, which despite the traditional styling of its products, nevertheless can out-compete most of its apparently more modern competitors in terms of environmental performance.

This is highlighted by the scores Morgan cars achieve in the Clifford-Thames/Cardiff University Environmental Rating for Vehicles (ERV). This system uses publicly available data to arrive at a single number that attempts to incorporate a vehicle's total environmental impact including toxic emissions, CO2 emissions and use of raw materials and energy in production. The ratings currently range from 2 for the worst to 60 for the best, with the average at around 15 or 16.

Table 1: ERV: Top 2 Roadster/Cabrio class

Ranking	Car	ERV
1	Morgan 4/4 1800	24
2	Lotus Elise S	22

(source: <http://www.clifford-thames.com>)

In fact, the overall rating of Morgan products is quite impressive, as can be seen from Table 2 which compares it with some other key models currently available in the market :

Table 2: Morgan ERV ratings compared with key performers

Ranking	Car	ERV	Vehicle weight (kg)
Best	Smart ForTwo 61hp	60	730
	Toyota Prius Hybrid	24	1250-1300
	Morgan 4/4 1800	24	880
	Morgan 4/4 2000	23	
	Morgan 4/4 3000	18	
	Morgan Aero 8	11	1130

	Porsche 911 Carrera 6-sp	8	1370-1450
Worst	Bentley Arnage	2	2585-

(source: <http://www.clifford-thames.com>)

It may surprise many environmentalists and industry observers that the Morgan 4/4 1800 achieves the same ERV score as Toyota's much lauded Prius hybrid-electric car. However, although the Prius scores well in terms of CO2 emissions, and scores well overall, it does have a weight disadvantage compared with the Morgan, as well as questions over its battery's recyclability and durability.

So, how do Morgans achieve this good ERV rating, and more broadly, why should Morgans be regarded as relatively 'green' cars? The answer covers a range of different parameters all of which contribute:

Low Weight

Low vehicle weight is inherent in the Morgan design philosophy and is aimed at achieving maximum performance. The means by which this is achieved include a simple chassis, minimal bodywork and the use of lightweight materials, notably wood and aluminium. In addition, the number of features and components not contributing to the primary function of the cars is very limited.

Materials use

The materials used in a Morgan include renewables, notably wood and leather. It also includes steel, which is easily recyclable and derived from relatively plentiful iron ore. Aluminium is used for the bodywork and for the structure of the Aero 8. Aluminium saves weight compared with more conventional steel, although it is highly energy-intensive to produce. However, it does offer the ability of easy recyclability at an energy input of around 15% compared with virgin aluminium. The use of finite fossil hydrocarbon-derived materials – such as plastics – is relatively low at Morgan.

Low Emissions

The low weight helps Morgan cars achieve relatively low fuel consumption and as a result relatively low levels of toxic emissions (carbon monoxide, hydrocarbons, NOx and particulates) and CO2 emissions (164g/km for the 4/4 1800 – which is around the EU average for all cars). This is further helped by Morgan's use of state-of-the-art engines from more mainstream manufacturers such as BMW with the resources to make engines to the latest designs. This is then combined with the latest engine management software to optimise the powertrain for the Morgan application. Morgan now also design their cars for the emissions standards of California, the world's strictest. The use of BMW powertrain components would also allow Morgan,

for example, to adopt BMW's new Efficient Dynamics technology designed to minimise CO2 emissions.

Durability

Durability is one area that is often overlooked by the mainstream car industry which is focussed on selling as many new cars as possible. However, the best way to preserve scarce resources is to use the ones we have already processed for as long as possible. In this respect a long-lived car is therefore better than a more disposable one. Not only do individual Morgan cars survive for a long time, many are rebuilt for a new lease of life. The company is also able to supply parts up to 50 years after a car has been produced thus ensuring it can be kept on the road with relatively little effort and at reasonable cost. The very long product cycles of 20-35 years used by Morgan ensure that models rarely become dated or obsolete. In fact, the 1930s styling has itself become a feature of Morgan cars and departing from this is risky. This ensures a continuity of design that makes a modern Morgan look as fresh – or old-fashioned – as an example from the 1960s or 1970s. This also ensures high residual values thus further prompting owners not to dispose of them prematurely, as well as making any investment in further preservation cost-effective even on older cars. The emotional attachment many owners have with the cars also helps durability.

The Morgan business model relies on making low volumes of durable cars. In a world increasingly concerned with sustainable consumption and production this is a very appropriate approach despite the fact Morgan's business model dates back a hundred years. Around 60-70 million cars are produced worldwide each year, a practice that is clearly unsustainable. In the longer term, if car making is to survive at all, then all car manufacturers will have to move towards a business model closer to that of Morgan and other low volume manufacturers. Lower volumes would be produced, but the business would survive on helping keep the cars on the road after the initial sale.

Manufacturing System

The sustainability of the Morgan approach to manufacturing derives from the detail of the processes used themselves, along with the materials selected and the design philosophy. However, just as durability in the product is an under-emphasised but important feature of sustainability, so is the value of small-scale manufacturing not fully appreciated. In brief, typical modern mass production of cars requires very large capital investments in the three major activities of pressing, welding and painting (to create the car body), along with a fourth area of investment in terms of the actual assembly tracks. Collectively these constitute the major fixed costs for mass production of cars, costs that can only be amortised when output is very high. Hence, in a competitive market, there is an in-built tendency for each company to seek to expand market share and achieve minimum economic scale by installing greater levels of fixed capacity. The result is that the biggest single contribution to unsustainability made by contemporary mass production systems is probably

over-production. Over-production results in cars being forced into the market via discounts and other incentive schemes, the effects of which are most obvious in terms of the rapid depreciation of new cars over the first three to five years of their useful lives. This rapid destruction of economic value is a key factor in older cars becoming obsolete: they are literally no longer worth repairing – in stark contrast with the situation outlined for Morgan cars described above.

In fact, Morgan can be regarded as using a version of what is termed Micro Factory Retailing (MFR). In general, MFR offers a range of strategic advantages compared with mainstream mass production: advantages that translate to genuine sustainable business: that is a business that is economically, socially and environmentally sustainable. These advantages include:

- Investments in productive capacity can be incremental, and thereby expand in line with the market. It is easier to ensure that capacity does not exceed demand: hence surplus demand is essentially managed through more or less long waiting times. This ensures continuity of production and employment. Moreover, new technologies in manufacturing are often easier to integrate.
- The incremental expansion of capacity can also have a geographic component in that new plants can be added to develop new markets. Thus far, Morgan has not exploited this opportunity (and it might be argued that a Morgan has to be built in Britain), but as a role model for other manufacturers it is an intriguing prospect.
- New products or variants can also be introduced incrementally, generally resulting in lower risk.
- Customers can be taken around the plant, can meet the people who will make their car, and can thereby feel 'closer' to the product. This has long been a feature of the Morgan approach, and interestingly enough it has been copied by many other companies trying to get stronger brand loyalty: including Mercedes-Benz, Rolls Royce, VW, Porsche, and BMW.
- The factory also becomes the location for repair, spare parts, in-use modification (e.g. external panel refresh) which allows the manufacturer to benefit directly from profitable aftermarket activities.
- The factory can undergo a transition over time from an essentially new car production focus, to one more involved in service and repair. That is, the factory does not depend absolutely on the continued sale of new cars. Bristol Cars has exploited this model well.
- The inherent flexibility of small-scale manufacturing is the practical basis upon which new levels of customer care can be built. The Morgan approach makes possible flexible response, shorter lead times, and late configuration. This again builds customer loyalty and enhances the value of the product while minimising waste, also contributing to brand reputation and product longevity.
- Stronger worker commitment to the product and to customers. These small factories escape from the 'mass' culture of traditional high volume manufacturing. Intriguingly, other vehicle manufacturers have sought solutions to worker boredom via such concepts as 'job enrichment', but in

the case of Morgan such enrichment is built into the manufacturing philosophy. This results in more satisfying work for staff, and better quality levels with all that this entails.

- This type of factory and manufacturing approach is the best means to take advantage of modular supply strategies combined with commodity or off-the-shelf purchasing. It also means that product up-grades via for example new engines can be integrated quickly and relatively easily, ensuring product performance stays at the forefront of the market.
- Manufacturing processes have a lower environmental impact compared with traditional high-volume manufacturing.
- Morgan manufacturing does not require a large, flat dedicated site with extensive support services. A modern car plant occupies several square kilometres of land. Compared with this, Morgan requires a classic 'light industrial' facility. Again, as a role model this is valuable.
- The Morgan approach clearly resonates with social and political objectives in Europe by creating local employment in high-value manufacturing activities. At a time when mass production jobs appear in danger of being removed to locations in Eastern Europe, India, China or elsewhere the Morgan approach makes a key contribution in retaining those skills and added value.

Forward Thinking

The experimental LIFECar project illustrates that Morgan is keen to develop a future direction in terms of models and technologies that offers enhanced sustainability. It might be thought that carbon fibre bodies and fuel cell powertrains are the preserve of the very few vehicle manufacturers with sufficiently large R&D budgets to support such exotic activities. However, along with the new technologies Morgan has sought to pioneer innovative approaches to product design and, for example, supplier relationships that have enabled the LIFECar project to come into being.

Indeed, the LIFECar demonstrates already that the most environmentally benign technologies currently available for cars is entirely compatible with sports car applications: even in fact that such applications are ideal for these technologies. In short, Morgan overall demonstrates quite clearly it is possible to be lean, green and have fun!