Editorial

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With the surge in environmental concerns all over the world, in particular global warming and air pollution which are partly caused by automobile transportation, the issue of a clean car is today clearly on the top of the agenda. The media are disseminating the feeling that the hybrid technology is an obvious answer to such problems. They are supported also by politicians and businesses needing to advertise their environment friendly policies and strategies. In the USA, which never signed the Kyoto protocol, General Motors, Ford and Chrysler are pressing President Bush to actively support a ‘national’ technology and therefore a ‘national’ industry for hybrids.[1] The 2008 federal budget includes $42 million to accelerate research on advanced battery technologies for hybrids. New York mayor, Michael Bloomberg, promised that all 13,000 ‘yellow cabs’ will be hybrid by 2012 from only 375 today![2] IKEA decided all its fleet will be 'hybridised' by 2010 in the UK.

During the last few years, another environmental issue – car recycling and End-of-Life Vehicles (ELVs) management – became a hot area of confrontation between the car industry and policy makers. The Directive 2000/53/EC on ELVs, which has been adopted after a ten-years technical and policy debate, imposes ambitious targets of reuse/recycling/recovery to be achieved in the near future, 'extended producer responsibility' for carmakers, limitations for the use of certain materials, standards of 'recyclability' of new cars, and other provisions that involve design and product making. Although the ELV policy is expected to produce innovative solutions, e.g., "design for dismantling and recycling", as well as organisational innovations in networking carmakers with dismantlers and recyclers, there are still significant difficulties in arriving at the targets of the new legislation in many countries. The position of European carmakers (ACEA) on the feasibility of the Directive's provisions is then rather critical but, at the same time, all carmakers are investing in technological and organisational solutions for recovery/recycling and 'recyclability'. However, some of these innovations can even have a trade-off with energy and emission efficiency, i.e., the other major environmental aspects of car production and use addressed in this special issue.

In order to avoid relying only on anecdotic events and propaganda pamphlets, there is an obvious need for academically based research on the economics and marketing of hybrid vehicles as well as on ELV-related technological and organisational innovation. It is the central objective of such special issue of the *International Journal of Automotive Technology and Management*. This special issue is a collection of six papers by academic experts of this industry, of which four on hybrid technologies and two on ELVs. All papers have been peer reviewed before being accepted.

The first paper, by Julius Teske and Jean-Jacques Chanaron, entitled 'Hybrid vehicles: a temporary step' aims at dealing with the hypothesis that the recent growing craze for hybrid vehicles in the USA and Europe is simply a temporary step between the traditional technology based on gasoline and diesel engines and the forthcoming of full electric vehicles probably with hydrogen powered fuel cells. The authors illustrate and discuss three basic statements:

- there is a general convergence of strategies towards promoting hybrid vehicles as the mid-term solution to very low emission and high mileage vehicles
- such a convergence is largely due to Toyota's strategy learning the technology while building up its own 'quasi-standard', thanks to its high quality and reliability reputation and its high market share on the North American market
- such a trend is due more to customer perception triggered by marketing and communication campaigns rather than to pure rationale arguments.

It is obvious that such statements lead to several: Is such a strategy sustainable on the long run? Or is it a short to mid term option which would then last only a few years and thus remain to limited manufacturing volumes? What are the triggers to consumer choice?

Some of the biggest car manufacturers promote hybrid technology as the best alternative to increase vehicle efficiency and the media look at it with optimism. Opponents to HEV obviously attack the technology with strong arguments against its technical complexity and challengeable overall efficiency. Indeed political pressures are also involved in the game.

The paper concludes that hybrid cars will probably take a significant market share in Japan and the USA due to market pressures, sustained by political lobbying, but will remain limited elsewhere in the mid-term. One of the main uncertainties is the potential development of hybrid car market in China where environmental issues are of significant concern.

A positive driving force to hybrid technology is certainly the difficulties in developing more sophisticated technologies such as fuel cells or batteries for full electric drive trains. Such alternatives require breakthrough disruptive innovations and would probably emerge in the very long future, i.e., at least not before ten or even 20 years. In the meantime, hybrid technology might have a real future.

The second paper, by Tugrul Daim and María del Rocío Nava Rodríguez, entitled 'Alternative motor fuels: a proposed forecasting framework using AHP and scenarios' proposes a forecasting framework that integrates an Analytic Hierarchy Process (AHP) with Scenario analysis techniques to try to forecast the best motor fuel of the future. The uncertainty surrounding oil prices makes very difficult to try to predict in a long-term basis whether an alternative motor fuel will be widely adopted. Different fuel motors are being developed but because there is not guarantee that their development and adoption will succeed, it is very important to try to identify specific circumstances that might be favourable, as well as unfavourable for each one.

In their framework, the authors consider economic, cultural, environmental, sustainability and development time factors analysed through 19 sub-criteria. Seven major motor fuels are taken into account as alternatives for the AHP model: Gasoline, Electricity, Biodiesel, Ethanol, Natural Gas, Propane, and Hydrogen. Four different scenarios are used to verify the 'robustness' of each motor fuel options: 'Status Quo', 'Environment Milieu', 'Economic Milieu' and 'Catastrophic'. Each scenario intends to stress out different key criteria that could impact the alternative motor fuel choice and stress out different key AHP criteria, allowing performing a sensitivity analysis to each alternative motor fuel.

The third paper by Stephen Jordan and Tugrul Daim, entitled 'Range based model for technology requirements hybrid vehicle technology assessment case study' presents a performance based technology assessment model. The model is used in a case study aimed at improving the performance (mpg) of a basic hybrid vehicle. The assessment model and case study include a gap analysis, a scouting report for candidate technologies, a technology evaluation and selection model, implementation recommendations, and a diffusion and adoption analysis. It is based on the assumption that hybrid vehicles are an innovation that can potentially reduce the amount of carbon emissions associated with traditional vehicles.

Technology assessment aims to find new markets for technologies identified by science. All technologies have latent capabilities suitable for product innovation. There are basically two types of technology assessments. The first type is a front-end method where a company possesses some technology and looks for a market to apply it. The second type is a back-end approach where a company is building a system and has identified a gap to fill. This gap filling processes identifies technology alternatives and determines which ones best fit their needs. The model presented in this paper is a back-end type approach but it is claimed that it could also be used as a front-end method. It is here applied to hybrid vehicles as well as fuel cells.

The fourth paper by Yeonbae Kim, Gicheol Jeong, Jiwoon Ahn and Jeong-Dong Lee, entitled ‘Consumer preferences for alternative fuel vehicles in South Korea’ analyses consumer preferences for alternative fuel vehicles based on stated preference data gathered in South Korea. Five fuel type vehicles are considered in the analysis, and a mixed logit model using the Bayesian approach is used for the estimation.

Estimation results show that preferences regarding fuel type and body type are heterogeneous but preferences for cost variables and horsepower are relatively homogeneous across consumers. The results also show that an indirect network effect exists influencing automobile demand and that consumers prefer a lower-polluting vehicle.

Simulation results show that diesel and hybrid vehicles will compete in the future for their shares of the market, with lower costs being the main source of competitiveness. Elasticity results show that fuel and maintenance costs are the most important factors influencing choice among alternative fuel vehicles; that an indirect network effect is important as well; and that changes in pollution emission rate are the least influential.

The estimation and simulation results suggest that government incentives for the operating of alternatives vehicles and government intervention aimed at expanding the availability fuelling stations and repair service facilities would be important to government policymakers seeking to create a market for such vehicles.

Based on the estimation results, makers of hybrid vehicles would be wise to concentrate business and research-and-development strategies on improving fuel efficiency and lowering pollutant emissions as well as to develop a sufficient service network and a parts and components network.

The two papers on ELVs aim at giving a very basic view of the issue by dealing with just two general aspects:

- the size of the ELV problem in terms of the likely future developments of the number of ELVs to be treated in European countries
- the response by vehicle manufacturers and the other industrial actors involved in the compliance with ELV legislation from the perspective of ‘strategic capabilities’ and managerial strategies.

The paper ‘A European model for the number of end-of-life vehicle’ by Frits M. Andersen, Helge V. Larsen, and Mette Skovgaard presents a model for the projection of the number of End-of-Life Vehicles (ELVs) in European countries. In spite of the existence of a specific ELV policy and legislation in force, there are still many uncertainties on the ‘true’ number of ELVs to be processed in the EU countries, which is partly due to trading of ELVs as second-hand cars to extra-EU destinations, and this represents a basic uncertainty also for the organisation of management networks and systems by carmakers.

The paper presents a baseline projection of the number of ELVs for the EU25, as well as the EU15 and the ten new EU Member States. Annual changes in the number of ELVs may differ considerably from what the model calculates, e.g., due to postponing scrapping of cars or to improving maintenance of older cars. Moreover, the model does not explicitly take into account inter-country variations in the costs of vehicles to users. However, reflecting different transport infrastructures and partly different user costs, the model accounts for national differences in the saturation level and income/GDP elasticity. Furthermore, the model allows different lifetime functions in different countries, that is, different mean lifetime of cars and average age of the car stock. The data and estimations reveal considerable national differences in the car density, the saturation level and the average age of the car stock.

Using a projection of demographic and economic development until 2030 the model projects the number of ELVs to be treated in the EU in the next 25 years. According to the model, a saturation in the stock of cars is not transformed into a slower increase in ELVs until after 2025. It means that the number of ELVs is bound to increase more than the number of cars. For the EU 25, the number of ELVs that have to be managed in 2030 is projected to increase by approximately 50%, or 6 million ELVs, compared to 2005.

This result suggests that responding to 'producer responsibility' by organising collection-dismantling networks can be an increasingly significant challenge for European car manufacturers as well as for non-European manufacturers exporting in the EU market. However, there could be economies of scale and scope in managing a greater number of ELVs due to the minimum viable scale of some collection and recycling operations as well as of the markets for some recyclable materials. In any case, the increasing number of ELVs to be treated makes technological solutions to respond to legislation requirements more and more urgent.

The paper by Joe Miemczyk and Andrew Graves 'Managing end-of-life vehicle networks: a longitudinal case of the UK' analyses the development of ELV management in the UK from the early 1990s to 2006. The research assesses the economic implications and industrial responses of a voluntary vs. legislative approach, with regard to legitimacy and competitiveness drivers within vehicle manufacturers and service providers (dismantlers).

The car industry views the ELV issue as a low competitive priority compared to other environmental concerns, in particular air emissions. At the same time, there are high liability risks that push in the direction of searching for innovative solutions.

The UK case highlights that a proactive voluntary approach will not necessarily stave off a legislated action. Management strategists claim benefits of proactive environmental strategy, but the UK experience demonstrates this is not always the case and should not be relied upon. However, while the voluntary approach has not survived in terms of structure and process, the network links that have been developed remain and have been very important in the response made by industry. In particular, the ability of the industries to act together to influence the exact way the legislation was interpreted is believed by the authors to be one reason why the UK may be seen as having an 'efficient' mechanism for complying to the ELV Directive.

The study takes a strategic capabilities perspective and then highlights the managerial implications of the ELV issue. For example, some firms are trying to develop aftermarket strategies to expand markets for 'branded' reconditioned parts and then get closer to vehicle last users as potential new customers. Vehicle manufacturers have contracts with a limited number of dismantlers to ensure they have take back network in place, often coordinated through a single broker. To ensure that opportunism on the part of dismantlers is minimised, contracts are more akin to supply partnerships, common in the automotive industry.

From the technological point of view, the struggle between a dismantling process approach against a shredder based approach is a significant one. It is still to be shown which will be the most effective for achieving the recycling targets at the lowest cost. While prices for complete components sold on the second hand market would give a better return despite the costs of dismantling, the ability to meet recycling targets is highly dependent on the consumer demand for parts (both in terms of volume and price sensitivity).

At the policy-making level, under the current regime there is limited incentive for industry to go beyond compliance and perhaps develop innovative solutions. In order to gain maximum input from industrial partners, it may be appropriate to introduce some kind of mix between regulation and a voluntary approach. If firms could directly link their environmental performance, e.g., 'recyclability', with operating profit, there would certainly be a greater chance of innovative responses by firms.

Obviously, this special issue of the *International Journal of Automotive Technology and Management* is not designed to put a final point to debates which will last several years. The issue of alternative technologies to the conventional power-train is not a new problem (Chanaron, 1998, 2001) and it will certainly continue to be a crucial one for the next decades. No obvious solution seems available and fierce competition as well as increased globalisation will probably shape the future options and drive the strategies. Many stakeholders are involved, including car and component manufacturers, Government agencies, R&D laboratories as well as millions of customers who will at the end decide which option is really feasible. So many cultural, political, sociological, economic and financial factors and constraints will surely influence such choices.

In the case of ELVs, instead, the possibility that consumers and markets are able to discriminate between different recyclability/recycling standards of cars – and will be ready to pay for those features – is very limited. All the issue seems to revolve around, on the one hand, the innovative capabilities of the car industry, of the many supplier and component producers involved in the issue and of the recycling businesses, and, on the other hand, the policy makers attitudes towards resources and waste (Mazzanti and Zoboli, 2006). In this regard, the development of Integrated Product Policy (IPP) and Sustainable Consumption and Production (SCP) as key concepts of EU environmental policy will surely generate new critical issues for ELV management in the next future.

References

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Notes

[1]Financial Times, 26/03/2007.

[2]Financial Times, 23/05/2007.