

Regulation & Engineering

By Nick Ballard

There is no doubt that we live in an increasingly regulated world. To some, “red-tape” inhibits creativity, stifles competitiveness, and adds to the cost of doing business, often without achieving the intended aims. To others it represents the individual citizen exercising restraint, through their elected representatives, on the worst excesses of globalisation. Let’s look at a recent example of regulation, namely the End-of-Life Vehicle Directive passed by the European Parliament in 2000, since this has the potential to highlight some of the issues involved. Although this discussion relates to European initiatives, the issues are part of a global problem.

Directive 2000/53/EC makes all EU vehicle producers and importers – like PSA, BMW, Mercedes, Fiat, Rover, Ford, GM, etc – responsible for the costs of disposing of their cars at the end of their useful life, wherever they may be, across all 25 EU states. The last owner of each vehicle must accept responsibility for delivery to an authorised disposal point free of charge. The Directive sets challenging recycling and re-use targets; for instance, 95% of all vehicles, by weight, must be recycled and 85% re-used by 2015. It also restricts or bans the use of certain hazardous materials in a finished vehicle, since on disposal the resulting waste is rendered toxic.

From an engineering perspective this presents a number of challenges. Designers must look at issues such as form, material properties and the combination of materials; not only from a functional view, but also from a recycling and reuse view. Designers do not use hazardous or difficult to reuse materials lightly; they use them because they are particularly suitable. For example, certain colours in paint and plastics require the use of chromium oxides. Similarly, if a certain type of foam or plastic is currently used because it is light or cheap, it may need to be replaced with a more expensive, purer form that can be reused for example, as low-grade filler for bumpers. To support sustainability there needs to be a switch to organic material, like jute, for upholstery fibres.

ELV is not the only EC Directive car designers have to think about. Recent Directives also cover waste electrical and electronic products, emissions and fuel efficiency. One way to improve fuel efficiency is to reduce the weight of the vehicle. Reducing weight would normally require more use of plastics, foam and composites, making it more difficult to recover that material to comply with the reuse and recycling targets in ELV. The solution has been a compromise, with more pure plastic and aluminium used, which in turn gives a higher weight to the finished vehicle. So there are many design trade-offs to be made for producers to achieve compliance. All of these choices have implications for the car producers and their supply-chains, not just in terms of material costs, but also in the potential investment required in new tooling and manufacturing techniques and ultimately in the cost to the customer.

This is just during the materials selection process; design for assembly/disassembly and recycling is another area where vehicle producers must make some fundamental

choices. Do they design to disassemble the car – strip it of all useful parts, including the engine – before the hulk is crushed, shredded and sorted, or do they design for it all to be crushed, shredded and sorted, without the need to remove parts beforehand? The way that assemblies are put together, the number of physical parts they contain, the materials they use, the position and use of bolts or fasteners, ease of access, tools used and, more critically, costs are as much dependent on which dismantling process is favoured as the preferred production method.

In Germany, there is a strong Green political lobby and, since car production is a key part of the German economy, an equally strong manufacturer's lobby group. Sustainable development has been on the political agenda for a number of years and forms one of the cornerstones of BMW's strategy for car manufacturing in 21st century Germany. BMW takes pride in their recycling and reuse strategy. Their recycling centre takes new models and dismantles them, feeding back information to the design teams and improving the disassembly process. Some parts are designed to be re-used and there is a large market for reconditioned parts in the servicing and warranty business, whilst others are designed to be easy to remove and separate prior to ultimate crushing and shredding.

This approach is in complete contrast to the French. Like Germany, they have had a voluntary ELV scheme for some time. Unlike Germany, they are unequivocal in their belief that it is uneconomic to design for disassembly, since this makes the processing costs of each ELV prohibitively high. With the annual cost of ELV disposal in France estimated at over €200m, one can understand their concerns. So PSA believes that design-for-recycling should be for cars to be crushed and shredded – no concessions to ease of dismantling needed, no high-specification parts for re-use, just separation of the materials once they are reduced to manageable sizes. PSA claims that the ultimate costs of such ELV disposal are significantly lower than the more labour-intensive, design-for-disassembly approach favoured by BMW.

So the path to ELV compliance may be achieved in different ways, which may in turn have a large effect on the design, materials and manufacturing processes employed, which in turn drive the particular model pursued for recycling and recovery. In our research on behalf of IBM in Europe, all the major OEM's had addressed, or were addressing, the engineering issues presented by ELV relating to manufacturing a compliant vehicle. What is missing is both an administrative and ELV reprocessing infrastructure by which recycling and reuse targets may be achieved and, importantly, by which compliance may be demonstrated and final disposal costs calculated. When we asked a French producer if they would consider investing in the ELV disposal business, the executive dismissed any such action, saying, "We create automobiles, not destroy them!" Similarly, producers in other regions saw no need to make vehicle disposal a core activity, yet acknowledged that the disposal facilities in their own countries were inadequate to meet current standards, let alone higher ones imposed by the Directive. Clearly, there will be a need for private investment in new ELV disposal centres and in systems that track vehicles, link registration and ELV deregistration, and which monitor the processing and recycling loop at local level to consolidate that information across all 25 EU States.

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The ELV Directive has already been partly successful, as it spurs research and investment into novel designs, materials and processes to recycle and reuse vehicles and in systems that demonstrate compliance. These are challenges that investors, engineers and their systems suppliers can address. What is uncertain is whether there is the political will to make it work and whether we, as individuals, accept that we have responsibilities to others, not just to ourselves.