Part 2: Machinery directive

"Cycles with pedal assistance, equipped with an auxiliary electric motor having a maximum continuous rated power of 0.25 kW, of which the output is progressively reduced and finally cut off as the vehicle reaches a speed of 25 km/h, or sooner, if the cyclist stops pedaling" are explicitly included in the scope of Directive 2006/42/EC on Machinery.

This Directive contains a list of essential health- and safety requirements related to the design and construction of machinery, i.e. pedelecs. Vehicles may only be placed on the market and/or put into service if they comply with these requirements.

Most of those health- and safety requirements are covered by EN 15194. However, in the European standardisation institute CEN, TC 333 'Cycles' is in the process of reviewing EN 15194 to ensure that all obligations resulting from the Machinery Directive are covered by the standard. Furthermore, whereas EN 15194 currently only covers the electric part of the bicycles and EN 14764 is applying to the mechanical part, the new standard will have technical requirements for the whole vehicle. When the review is completed, a reference to the new standard will be published in the Official Journal. This will turn EN 15194 into a harmonised standard under the Machinery Directive. That means that if a pedelec compliesw with EN 15194, it will be presumed to comply with Directive 2006/42/EC.

Administrative obligations

The Machinery Directive holds a few additional administrative obligations for the manufacturers. They have to have a complete technical file on the product available. Furthermore, they have to supply the pedelec with an EC Declaration of Conformity, the particulars of which are specified in Annex II of the Directive. The vehicle must have a CE conformity marking with the initials "CE". The CE marking shall be affixed to the pedelec visibly, legibly and indelibly in the immediate vicinity of the name of the manufacturer or his authorised representative. This marking however, can only be affixed if the pedelec also conforms to Directive 2004/108/EC relating to electromagnetic compatibility and to the RoHS Directive.

It is prohibited to pre-date or post-date the pedelec when affixing the CE marking.

Read the comprehensive guide to the application of the Machinery Directive.

Finally, in addition to the CE marking, the pedelec must be marked visibly, legibly and indelibly with the following minimum particulars:

- the business name and full address of the manufacturer and, where applicable, its authorised representative
- designation of the pedelec
- designation of series or type
- serial number, if any
- the year of construction, that is the year in which the manufacturing process is completed.

Part 3: Electromagnetic compatability

All electric devices influence each other when interconnected or close to each other. Sometimes one may observe interference between a TV set, a mobile phone, a radio and a nearby washing machine or electrical power lines. The purpose of electromagnetic compatibility (EMC) is to keep all those side effects under reasonable control.

Pedelecs with an electric motor having a maximum continuous rated power of 0.25 kW and assisting up to maximum 25 km/h must comply with this Directive. For all other electric bicycles, the EMC requirements are in the type-approval legislation.

The Directive specifies legally-binding protection requirements. As far as the above-mentioned pedelecs are concerned, most of these requirements are covered by EN 15194. But compliance with EN 15194 does not automatically equal compliance with the EMC Directive.

EMC assessment

The manufacturer has to apply his own methodology for the EMC assessment. He has to prepare technical documentation to demonstrate evidence of compliance with the requirements and have that documentation available. He may opt on a voluntary basis to involve a Notified Body during the conformity assessment procedure. The manufacturer is also required to supply the pedelec with an EC Declaration of Conformity, the minimum content of which is specified in the Directive. He has to affix the CE marking. This however, cannot be done unless the product also complies with the Machinery Directive and the RoHS Directive.

Traceability

The EMC Directive requires that pedelecs are identified by type, batch, serial number or any other information allowing for the identification of the vehicle. In order to facilitate traceability, the actual manufacturer needs to be identified by name and address. In case the manufacturer is located outside of the European Community, also the name and address of the authorised representative or (when neither are in the Community) the person responsible for placing the pedelec on the Community market needs to be noted. This information has to accompany the pedelec.

Find legal EMC requirements in Directive 2004/108/EC.

Next to the EMC Directive, the EN 15194 has some additional marking requirements. All electrical and electronic sub-assemblies (ESAs), except for cables, shall bear the following indelible and clearly legible markings:

- make or name of the manufacturer of the ESAs and their components;
- trade description.

Part 4: RoHS directive

Directive 2011/65/EC on the restriction of the use of certain hazardous substances in electrical and electronic equipment applies to pedelecs with assistance up to 25 km/h and a maximum continuous rated power of no more than 250W. All other electric bicycles are not in the scope of this Directive.

As a result, the pedelecs that have to comply with the Directive may not contain any lead, mercury, cadmium, hexavalent chromium, polybrominated biphenyls (PBB) or polybrominated diphenyl ethers (PBDE).

The manufacturer has to certify that his product complies with the RoHS Directive by means of a CE marking. This however, cannot be done unless the product also complies with the Machinery Directive and the EMC Directive. In order to comply with the RoHS Directive, the manufacturer also has to draw up technical documentation, carry out an internal production control procedure and provide for a declaration of conformity.

What does the European Commission say about the RoHS Directive?

(Photo Derby Cycle)

Part 5: Battery transportation

One of the major risks associated with the transport of batteries and battery-powered equipment is short-circuit of the battery as a result of the battery terminals coming into contact with other batteries, metal objects or conductive surfaces. Therefore, their transport is subject to very strict rules, which have been internationally harmonised.

Any Lithium-Ion battery over 100 Wh is classified as CLASS 9 - MISCELLANEOUS DANGEROUS GOODS under the dangerous good regulations for transport by road (ADR), by air (IATA & IACO) and by sea (IMDG). Lithium-Ion batteries for pedelecs are more than 100 Watt-hours. As a result, their transport has to comply with these regulations. The UN number for Lithium-Ion batteries is 3480, if contained in or packed with equipment 3481.

These rules do not only concern transport of batteries for instance from manufacturer to dealer, but all transport, except transport for private purposes. Firstly, to ship goods in the CLASS 9 category means that the battery needs to be tested in accordance with the UN Manual of tests and criteria, Part III, subsection 38.3.1.

Replacement batteries

Batteries manufactured, distributed or sold by major companies usually comply with the UN test requirements. However, certain replacement batteries, which are not OEM or aftermarket batteries but simply low-cost copies of those, may not have undergone the required tests. Untested batteries are consequently excluded from transport.

Users of equipment powered by Lithium-Ion batteries should therefore be vigilant when buying replacement batteries from unknown sources, such as on markets or the web. The differences between genuine and copied battery types may not be visible but could be very dangerous; such untested batteries may have a risk of overheating or causing fires.

Recharge, the European Association for Advanced Rechargeable Batteries proposes an e-book providing all information about UN transport regulation of Lithium batteries. It costs € 89 and can be downloaded here.

Procedures related to handling, packing and labelling

As for the transport of Lithium-Ion batteries, very specific and strict procedures related to handling, packing, labelling and shipping need to be followed.

If any company handles, packs and labels dangerous goods, such as Lithium-Ion batteries at their own premises, a trained "Dangerous Goods Advisor" is required onsite to oversee that this is done in full compliance with the rules and to declare the goods safe to travel. If you have no member of staff which has received the above training, you must hire a specialist company to handle, pack and label the goods and to fill out a "Dangerous Goods Note". It is compulsory for Dangerous Goods shipments to be accompanied by this document.

There are also weight restrictions for the transport of batteries. A package shipped by air containing a lithium battery may not exceed 10kg gross. The weight limit per package shipped by road or sea is 30kg gross.

Class 9 hazard label

If the lithium batteries are contained in the bicycle or packed with it, they are not required to have a Class 9 hazard label and there is no requirement for a Shipper's Declaration for Dangerous Goods for consignments of these batteries. Nevertheless, they must meet the packing instructions of the relevant transport regulations (ADR, IATA, IACO or IDMG). And, in the event of an incident involving these batteries, the incident reporting requirements apply.

Furthermore, only batteries that have successfully passed the test procedures of Part III, Sub-Section 38.3.1 of the UN Manual of Tests and Criteria qualify under this exception. This also applies to so-called "OEM" or "aftermarket" batteries. Any battery manufacturer or distributor should be able to provide documentation, confirming that the batteries have been so tested.

There will be occasions where a manufacturer may wish to have a defective or damaged battery returned for analysis. However, such batteries are prohibited from transport by air. This prohibition also applies to waste batteries and batteries being shipped for recycling or disposal. The rules for transport of defective, damaged and waste batteries by road or by sea are inconclusive and are currently being discussed in the relevant international committees.

Part 6: Battery directive

Batteries may contain metals such as zinc, copper, manganese, lithium and nickel, which present a risk to the environment and human health if they are incorrectly disposed of. Consequently, the collection, recycling, treatment and disposal of batteries and accumulators are ruled at European level by Directive 2006/66/EC, also known as the Battery Directive.

This Directive also prohibits the placing on the market of most batteries and accumulators with a certain mercury or cadmium content.

The Directive applies to all batteries and therefore also includes the Lithium Ion (Li-ion) and Nickel Metal Hydride (Ni-M-H) batteries commonly used in electric bicycles. These are classified as "industrial batteries". Such batteries may no longer be incinerated or disposed of in landfills.

Recycling

The Battery Directive establishes one framework for the collection and recycling of batteries in all member states. It also sets out minimum rules for the functioning of national collection and recycling schemes, in particular for the financing of these schemes by the producers. It is up to the battery producers to finance the cost of the collection, treatment and recycling of waste batteries. Although he may organize everything himself, most producers will use the services of the national collection scheme.

Here is an overview of these national collection schemes. Also, this website offers short and very comprehensible e-learning courses that deal with all different battery aspects including collection, storage and discarding end-of-life and damaged batteries. These courses can be recommended highly to electric bicycle dealers.

The producer is the person in a Member State who supplies or makes available to a third party, batteries (including those incorporated into vehicles) in that same Member State for the first time on a professional basis. This definition applies irrespective of the selling technique used and irrespective of whether the batteries are made available in return for payment or free of charge. This includes import into the European Union.

These specific measures apply to industrial batteries:

- Producers must be registered in the national register of all Member States where they place batteries on the market for the first time. If for instance, the manufacturer of the battery in an electric bicycle or the manufacturer of the electric bicycle or his representative are not registered nationally, the dealer will be considered to be the producer of the battery and will be held responsible
- Producers of industrial batteries or third parties acting on their behalf have an obligation to take back waste industrial batteries
- Industrial batteries have to be readily removable from electric bicycles. If the battery is integrated in the bicycle, it has to be accompanied by instructions showing how the batteries can be safely removed and who is the best person to do this
- Batteries must be labeled with a crossed out wheeled bin and chemical symbols indicating the heavy metal content of the battery
- All collected industrial batteries must be recycled. Industrial batteries may not be disposed of in landfills or by incineration. Since September 2011, battery recycling processes must meet minimum recycling efficiencies of 65% for lead-acid batteries, 75% for nickel-cadmium batteries and 50% for other batteries, with the best lead and cadmium recycling possible.

The producer's obligation to take back waste batteries has some very concrete and practical implications for his dealers. The producer must offer the possibility to collect these batteries through the dealers he works with. For this collection, the dealers have to carefully follow safety procedures:

- Put waste batteries in a dedicated container that will be supplied by the national collection scheme the producer works with
- Cover the poles with tape and wrap the batteries in transparent plastic foil or a plastic bag so that, when they are sorted, it is visible if a battery is damaged
- Place the container in sight of staff, in a dry, cool and well-ventilated environment
- Avoid mixing lithium-ion batteries with other batteries as well as with other conductive or inflammable materials
- Make sure batteries are never left in the wet or outside unprotected
- Do not put damaged batteries in the container for waste batteries. They cannot be transported in the same way as waste batteries. You should ask your national collection scheme for instructions.

Read more about battery collection and recycling rules.

This particular check has shown that the Directive is now fully transposed in national law and that collection rates for batteries are high. However, there appear to be a few shortcomings.

The Commission has found for instance that the eco-design requirements for batteries offer room for improvement. Stakeholders themselves have argued that easy recyclability should become a mandatory requirement. The check has also shown that in this framework, the growing use of Li-Ion batteries in electric vehicles is not yet properly addressed. A rapid expansion of the Li-Ion battery market is expected by 2015. For these batteries re-use rules would be useful, as they will still have 80% capacity at the end of life of an EV. Further challenges will need to be addressed stemming from the lack of recycling facilities. Moreover, the current methodology for recycling efficiency appears to be not fully in line with the Battery Directive goals, particularly for the recycling of Li-ion batteries, as 50% recycling efficiency target does not guarantee the recycling of hazardous and scarce materials.

Another problem that became apparent through the health check is the double charging for WEEE collection and batteries incorporated in WEEE, which creates unnecessary costs for producers and consumers.

Finally, the definition of "producer" differs between the Battery Directive and the WEEE Directive, which complicates the enforcement of the two laws, especially when it comes to Internet sales. According to the current definitions, dealers are not obliged to register EEE sold over the Internet but are obliged to register batteries incorporated in these EEE, which leads to confusion and misreporting. A harmonisation of the definitions of "producer", "distributor", "placing on the market" and "making available on the market" in all two Directives would solve this problem. However, the Commission is not expected to propose any amendments to the Battery Directive before 2016.

Very recently, the European Commission has put the Battery Directive through a so-called "health check". This is a relatively new procedure that allows the Commission to assess whether legislation is still up-to-date, correct and relevant.

(Photo Eurobike)

Part 7: Waste Electrical and Electronic Equipment (WEEE)

Directive 2012/19/EU on waste of electrical and electronic equipment (WEEE) is aimed at improving the collection and recycling of the said waste. The objective of this Directive is to protect the environment and public health by preventing or reducing the adverse impacts of WEEE and by reducing overall impacts of resource use, thus contributing to sustainable development.

"Cycles with pedal assistance which are equipped with an auxiliary electric motor having a maximum continuous rated power of 0.25 kW, of which the output is progressively reduced and finally cut off as the vehicle reaches a speed of 25 km/h, or sooner, if the cyclist stops pedaling" are explicitly included in the scope of this new Directive, which the member states had to transpose before 15 February 2014. Any electric bicycles subject to type-approval legislation, such as speed pedelecs for instance, are not subject to the WEEE Directive. The Battery Directive however applies to all types of electric bicycles.

As a result of this Directive, private EEE users should have the possibility to return WEEE free of charge to the distributor. When supplying a new product, distributors must accept to take back such waste at least free of charge on a one-to-one basis as long as the equipment is of equivalent type and has fulfilled the same functions as the supplied equipment.

The producers are responsible for taking back the WEEE from the distributors. For that purpose they should be able to choose to fulfill this obligation either individually or by joining a collective scheme.

In other words, if a customer buys a new electric bike, the dealer has the obligation to take back his old electric bike, whilst the manufacturer has to arrange for taking it back from the dealer and recycling it.

Read more about the European Commission's rules on WEEE.

Definition of producer

'Producer' means any natural or legal person who, irrespective of the selling technique used, including distance communication is:

- established in a Member State and manufactures EEE under his own name or trademark, or as EEE designed or manufactured and markets it under his name or trademark within the territory of that Member State
- established in a Member State and resells within the territory of that Member State, under his own name or trademark, equipment produced by other suppliers, a reseller not being regarded as the 'producer' if the brand of the producer appears on the equipment, as provided for in point 1
- established in a Member State and places on the market of that Member State, on a professional basis, EEE from a third country or from another Member State; or sells EEE by means of distance communication directly to private households or to users other than private households in a Member State, and is established in another Member State or in a third country.

Producers or their authorised representative, including those supplying EEE by means of distance selling, must be registered in every member state that they sell to. This registration is different form the registration relating to the Battery Directive.

Registration

For that registration, the producer has to provide, next to general administrative details, the following information:

- type of EEE (household or other than household equipment)
- brand name of EEE
- information on how the producer meets his responsibilities: individual or collective scheme, including information on financial guarantee
- selling technique used (e.g. distance selling)
- declaration stating that the information provided is true.
- quantity of EEE placed on the national market, by weight
- quantity, by weight, of waste of EEE separately collected, recycled (including prepared for re-use), recovered and disposed of within the Member State or shipped within or outside the Union.

Each Member State has to ensure the implementation of the 'producer responsibility' principle and, on that basis, ensure that a minimum collection rate is achieved annually. From 2016, the minimum collection rate will be 45%, calculated on the basis of the total weight of WEEE collected in a given year in the Member State concerned, expressed as a percentage of the average weight of EEE placed on the market in the three preceding years in that Member State. Member States shall ensure that the volume of WEEE collected evolves gradually during the period from 2016 to 2019.

For each WEEE category, the Directive sets out minimum recovery targets. However, the Commission still needs to clarify under which product category pedelecs fall.

Part 8: REACH

REACH is the Regulation on Registration, Evaluation, Authorisation and Restriction of Chemicals. It entered into force on 1st June 2007. It streamlines and improves the former legislative framework on chemicals of the European Union.

REACH is aimed at ensuring a high level of protection of human health and the environment from the risks that can result from chemicals, at promoting alternative test methods, improving the free circulation of substances on the internal market and enhancing competitiveness and innovation.

As a result of REACH, the industry must assess and manage risks resulting from chemicals. REACH also obliges industry to provide the users with appropriate safety information. However, the legislation only applies to substances manufactured or imported above 100 tonnes per year.

Find further information on REACH here.

(Photo Trek)