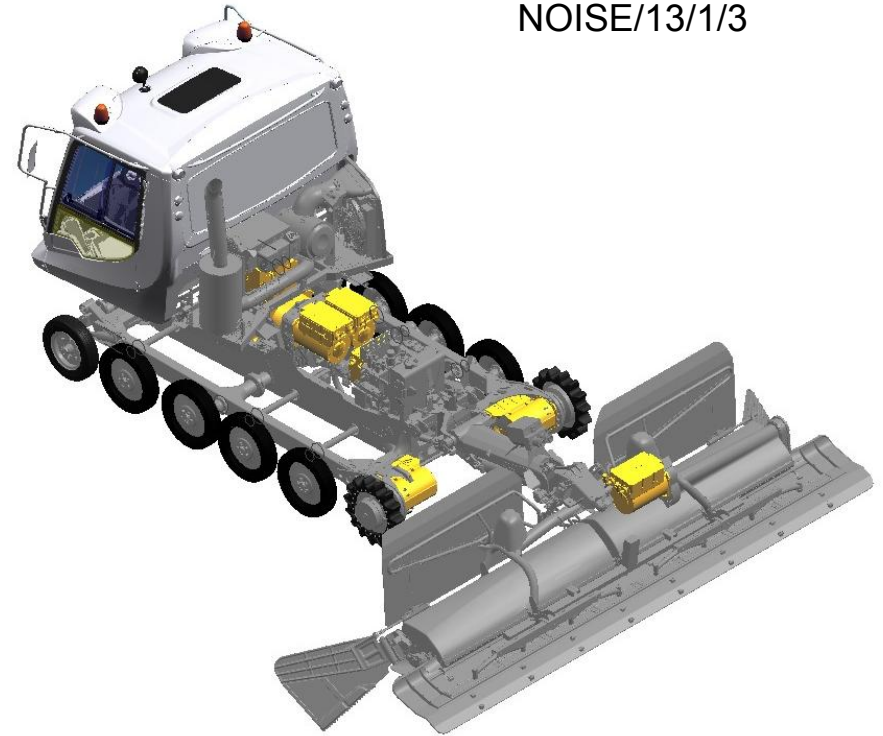




NOISE/13/1/3

Hybrid vehicles in the scope of 2000/14/EC



Tobias Fleckenstein

TÜV SÜD Industrie Service GmbH, NB0036



Definition of hybrid vehicles:

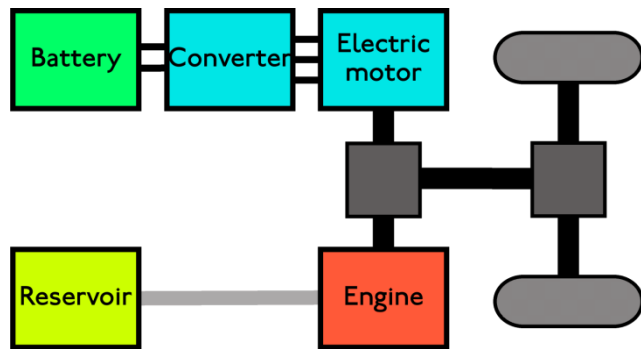
Hybrid vehicles are vehicles with two or more power sources in the drivetrain. There are many different types of hybrid vehicles, although the combustion engine hybrid is currently commercially available.

Hybrids are classified by the division of power between sources; both sources may operate in parallel to simultaneously provide acceleration, or they may operate in series with one source exclusively providing the acceleration and the second being used to augment the first's power reserve. The sources can also be used in both series and parallel as needed, the vehicle being primarily driven by one source but the second capable of providing direct additional acceleration if required.

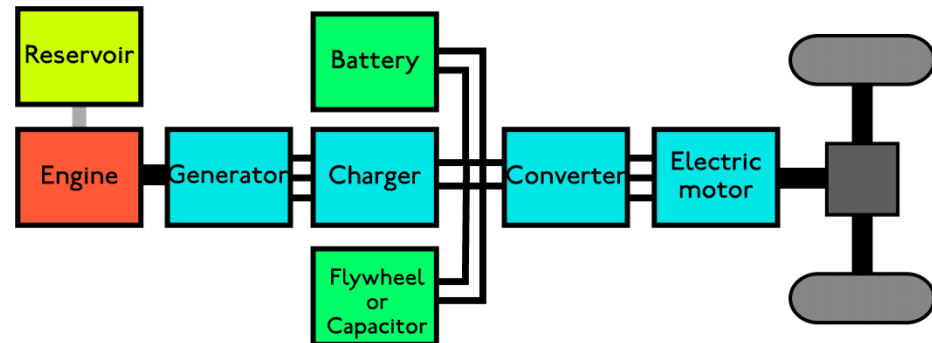


Different kind of hybrid vehicles:

parallel hybrid electric



series-hybrid vehicle





Question / Problem:

- What power sources shall be including when defining the “Permissible sound power level”? Shall installed electric power be used? Shall diesel power used only for recharging be included?
- It will probably be possible to report “Measured sound power levels” both at battery powered working conditions, and at the same working conditions together with recharging during the complete test (=worst case). Shall both extremes be reported?
- Manufacturers will probably have specifications for the battery traction capacity and they will ask for benefits regarding a reported “Guaranteed sound power level” below the “worst case” value. Forms for such benefit models are needed.



Question / Problem:

- What power sources shall be including when defining the “Permissible sound power level”? Shall installed electric power be used? Shall diesel power used only for recharging be included?

$$P_{\text{lim}} = P_{\text{el}} + P_{\text{CE}} \quad ?$$

But this power is available often for some seconds only!



Question / Problem:

- It will probably be possible to report “Measured sound power levels” both at battery powered working conditions, and at the same working conditions together with recharging during the complete test (=worst case). Shall both extremes be reported?



Question / Problem:

- Manufacturers will probably have specifications for the battery traction capacity and they will ask for benefits regarding a reported “Guaranteed sound power level” below the “worst case” value. Forms for such benefit models are needed.



Additional question:

Is it necessary to define special test codes for hybrids?



Additional question:

Is it necessary to define special test codes for hybrids?

- Equipment less noisy in practice
shall appear less noisy at the label
- Avoid abuse of such rules to circumvent the limits

Is it permissible to perform the sound power level measurement at a reduced speed an automatically operating speed control adjusts for the work cycle defined in the directive?

The Question by Bengt Zetterström – SMP Svensk Maskinprovning AB

Series hybrid wheel loader

- What power sources shall be including when defining the “Permissible sound power level”? Shall installed electric power be used? Shall diesel power used only for recharging be included?
- It will probably be possible to report “Measured sound power levels” both at battery powered working conditions, and at the same working conditions together with recharging during the complete test (=worst case). Shall both extremes be reported?
- Manufacturers will probably have specifications for the battery traction capacity and they will ask for benefits regarding a reported “Guaranteed sound power level” below the “worst case” value. Forms for such benefit models are needed.

Answer from NB Group under Machinery Directive 1/2

NOISE/13/1/3

Answer from Mr. Kruger and Mr. Chielens – NB Group under Machinery Directive

.....
4) Recommendation for Use sheet (RfUs) CNB/M/00.250 RERev 06 states:

1. BASIC PRINCIPLES

...

The task of a notified body in the field of Machinery is restricted to an examination of conformity with the Machinery Directive.

The notified body, as per Article 14 of Directive 2006/42/EC, which is responsible for carrying out the EC type-examination procedure defined in Article 12 (3) (b) and Article 12 (4) (a) for a machine specified in Annex IV, is only required to carry out the operations defined in the above mentioned Article and in Annex IX.

In particular, where a machine or one of its components is subject to Community Directives other than the Directive 2006/42/EC, there is no requirement to check whether these other Directives are being respected. In which case, **the notified body must draw the attention of the contractor to his obligation to complete his technical file** (also termed technical documentation or technical construction file) with reference to other Directives applicable to the machine. In effect, the manufacturer must ensure that these other Directives are being respected, and pursuant to Article 5 (4), the CE marking affixed by him or his authorised representative (article 5 (1) (f)) in accordance with article 16 means that the machine also conforms to the provisions of those Directives.

NOISE/13/1/3

Answer from Mr. Kruger and Mr. Chielens – NB Group under Machinery Directive (G. Bienveignant Technical Secretary)

.....
Finally and as you probably know, only the manufacturers (or their authorized representatives) of machinery referred to Annex IV shall apply one of the procedures as described in Article 12.3 and 12.4 (amongst them: EC type-examination procedure or full quality assurance procedure by a Notified Body). **The earth-moving machinery are not listed in Annex IV and consequently the Notified Bodies have no experience about the problems raised by the noise emitted by these machines.**

To know if there is some working group who is facing the problem of specific noise test codes for earth-moving machinery please contact CEN.

We are sorry for the length of our reply and its negative conclusion.
Nevertheless, we remain at your disposal should you need further information.

Yours sincerely,

G. Bienveignant Technical Secretary of the European Co-ordination of Notified Bodies under machinery Directive 2006/42/EC.

Answer from Jean JACQUES - INRS Mission Normalisation

The noise test codes for earth-moving machinery are given in ISO standards (ISO 6393 and 6394 for static tests and ISO 6395 and 6396 for dynamic tests). As you know, 2000/14/EC refers to ISO 6395 for the determination of LW. In these standards, **the source of power is not mentioned explicitly** and I would think that they are technically applicable to electrically powered earth-moving machinery. ISO 6395 has a number of normative annexes, each specific to a family of earth-moving machines. Their applicability to electrically powered machines should be checked by people knowing well these machines.

Now, regarding noise declaration. **I think that the "worst case" rule should be applied here but for each power source considered separately**, especially as the noise emissions with the two types of power sources are going to be quite different. This is one easy way to promote the electric power source as a low-noise emission setting of the hybrid machine. My suggestion is then that manufacturers **declare noise emission quantities for both power sources**. If there are several operating conditions with the electric power that are typical of normal use, the "worst case" value would have to be declared.

To my knowledge there is no revision work in progress in ISO TC 127. **If there is a consensus to have actually two noise declarations, one for each power source, then a short standard, specific to hybrid machines, could be drafted.** It would :

- make reference to the current ISO series of noise test codes, with deviations if necessary,
- specify the operating conditions when electrically powered
- have a clause on noise declaration where a requirement for a double declaration would be given.

THE PROBLEM HAS TO BE FACED IN THE FRAME OF 2000/14/EC

1. According to Outdoor Directive manufacturers have to guarantee only **one** level

2. Outdoor Directive main objectives:
 - protection of environment;
 - free movement of goods in EU
 - CE marking

2000/14/EC DIRECTIVE: ANNEX III – PART A

2.3. Test of powered equipment under load

.....

If the equipment is fitted with several engines and/or aggregates they must work simultaneously during the tests.




If this is not possible, each possible combination of engine(s) and/or aggregates is to be tested.

For each type of equipment that is to be tested under load, specific operating conditions must be laid down which shall, in principle, produce effects and stresses similar to those encountered under actual working conditions.

ISO 6395: DYNAMIC TEST CONDITIONS

The source of power is not explicitly mentioned.

Hybrid machines = Complex problem

- Is the current Directive suitable also for hybrid machines ?  Only partially (see Annex III Part A 2.3) ... but ... how to determine the installed power **P** for noise limits?
- Does it make sense to perform measurements with the two power sources working one at a time and/or combined ?  A common position by the NB Noise group is necessary
- Are the procedures in ISO 6395 suitable as “starting procedures” for Hybrid machines ?  A common position by the NB Noise group is necessary

Working group is necessary !

NB subgroup for a proposal
of solution/ amendment
(Task in strict cooperation
with COM, ADCO, WG7, ...)