Euromot

NOISE NOMEVAL Report

Study on the experience in the implementation and administration of Directive 2000/14/EC relating to the noise emission in the environment by equipment for use outdoors - Final Report

The Euromot Position

as of 27 November 2007

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EUROMOT
Engine-in-Society

Euromot is the **European Association of Internal Combustion Engine Manufacturers**.

We represent the leading manufacturers of internal combustion engines used in a broad range of nonroad and marine applications (construction, mining and material handling equipment, trucks and buses, agricultural and forestry equipment, lawn/garden and recreational equipment, commercial marine and seagoing vessels, workboats and pleasure boats, rail traction, power generation).

Euromot has been working for many years with international regulatory bodies, eg European Union, the UN Economic Commission for Europe (UNECE), the UN International Maritime Organizations (IMO) and the Central Commission for the Navigation on the Rhine (CCNR). In addition, we are seeking an open and fair dialogue with national governments to provide reliable know-how on advanced internal combustion engine technologies in general and, in particular, on the feasibility of environmental as well as cost-effective product regulations. To achieve a pro-active engagement of all stakeholders in international harmonisation of regulations affecting engines and equipment, we coordinate our activities worldwide with trade associations of the nonroad and marine industry sector.

For further information about our Association please pay us a virtual visit at **http://www.euromot.org** – your bookmark for engine power worldwide.

1. General

This position contains the concerns and the recommendations of the engine manufacturers that are members of Euromot. The engine industry is extremely concerned about the development in the review process of the outdoor noise directive 2000/14/EC. The position includes technical aspects and recommended counterproposals of the engine industry. These aspects show a possible way for the introduction of a reviewed noise directive that is based on adequate technical boundary conditions and necessary exemptions due to technical demands.

In general this position paper contains technical information about the necessity of the usage of machines propelled with reciprocating internal combustion engines (diesel, gas and petrol) that offer an independent power supply and fast applicable service in the professional forestry and agricultural sector.

Furthermore a very general and important clarification should be made regarding the quantity. The relevant quantity, A-weighted sound power level, should be written out ($L_{w,A}$ [dB re 1 pW])

2. Gensets

2.1 Portable gensets (low power generator sets <<400kW)

According to EN 12601:2001 (see ISO 8528-8) “low power” is taken to mean power of magnitude up to approximately 10 kW. Low-power generating sets for the purpose of this standard are determined by the following special features:

- The users normally are laymen
- The complete generating set is usually transportable or mobile
- The electrical output is connected by plugs and sockets (except for extra low voltages)
- The generating set is ready for use without any additional work by the user.

The current market situation shows that **almost ¾** of the low power generator sets sold in EU27 are “open type” gensets. This kind of gensets has no encapsulation in order to be manageable and light. The intended area for the use of this kind of gensets are construction sites, workplaces of carpenters or the municipality.

The today market requirements demand already encapsulated low power generator sets (**1/4** of the low power generator sets sold in EU27) for customer reasons. They are used for example for the power supply of market stalls, for leisure purposed or public events.

Recommendation:

- Do not install stricter noise limits for open type low power generator sets. Stricter noise limits would make professional open type generator heavier and would make them less manageable.
- Retain stage II noise limit values for these generators

2.2 Gensets (<400kW)

In general the emission requirements of the consolidated version of the Directive 97/68/EC requires tremendous efforts for the engine manufacturers. Further mandatory noise requirements would mean a unnecessary burden for the engine industry that has to manage the research and

development work on emission reducted engines for the next emission stage IIIA that has to be applied beginning of 2011.

Nevertheless noise is a sales argument. Therefore there are already many low noise models available on the market. However, we would like to point out that the stipulated limits for generator noise emissions are the stricter the smaller the electrical output of the generator is (see table below):

Power generators <400 kW	Power [kW]	Current noise (stage II)	Recommended limits	Difference [dB]
	Pel≤2	95+lg Pel	90	-5
	2<Pel≤10	96+lg Pel	93	(-3) - (-4)
	Pel>10	95+lg Pel	93+2lg Pel	(-1) - (+1)

This seems not be logical. It is probable that bigger engines are already encapsulated. Smaller engines would have to fulfil disproportional demands in order to meet the very strict noise limit values. This would mean that smaller engines would become more expensive. There are already encapsulated container for bigger engines available but not for the smaller engines, because the application is different, considering e.g. requirement for portability and mobility.

The increase in recommended noise limit is in no proportion to the generating set output. We feel the limit sequence should not be such a discrete one, but to allow for variation in output, as does the current stage II regulation.

2.3 Gensets (≥400kW)

Meeting the recommended noise limit of 93+2lg Pel for engines ≥400 kW would cause a major redesign of the engine and an increase in costs of product.

- This size of gen-set is normally supplied in a modified standard ISO container. This would no-longer be possible and special purpose containers would have to be designed and built.
- The external size of the package for a given power would increase considerably to allow of additional cooling inlet/outlet attenuation, much larger silencers and additional sound insulation, also possibly causing operational impediments and in worst case degradation of the generating set efficiency. The implications of additional enclosures on the transportation cost and energy use during transportation should also be considered. The projected decrease of efficiency is not in accordance with the general urge to sustainable use of energy and to improve energy-efficiency.
- The stage IIIA engines that will be used by then have increased cooling requirements further exacerbating the situation.
- The cost to the customer would rise considerably for the reasons detailed above.
- Even meeting the current 2000/14/EC limits but applied over 400kW would require a lot of the same changes as described above. The higher the power the bigger the issue. The formula used does not seem to be representative of real life noise levels above 400 kW for a given noise reduction technology.
- Again, the power output range starting from 400 kW is very large. Considering the largest “mobile” units, e.g. containerised power plants, the power output can be in the range of 4000-5000 kW. This is very different from 400-500 kW units, considering cooling, ventilation and exhaust noise emission, but also the scope of application. We propose a continuous noise emission limit increase as a function of engine output, e.g. in the spirit 93 + X lg Pel. The value for X can be discussed. Our proposal is a value in the range 6…9.

We would like to point out that the stipulated limit for generator noise emission in the higher output class ≥400 kW is 93 + 2 lg Pel. This is very ambitious regarding the same limit for lower output class.

Recommendation:

We express our concern regarding the very coarse classification of different generation equipment, operating on a very large output range from several kilowatts to megawatts, with very different operational applications and environments.

The requirements for generatos ≥400 kW are not in line with the requirements especially for the cooling equipment and it's noise generation. If the mechanical power output doubles, so will the need for cooling capacity, and fan noise. The suggested formula induces limit value increase of only 0.6 dB, whereas an increase of 2-3 dB would be more reasonable per doubling of output. Thus, we think a limit value formula in the spirit 93 + (6-9) lg Pel would be more reasonable.

3. Handheld products

3.1 General

In general the NOMEVAL report does not consider sufficiently the interaction with other regulations, e.g. the Machinery Directive or the consolidated Directive for nonroad mobile machinery that regulates the emission limits for the engines used in this kind of machinery.

The tightening of criteria for the market access by new noise emission limits leads to additional monetary efforts for the engine industry. The technical development status of handheld produts is very well-engineered. As the scope for development is small the further reduction of the noise requirements will cause necessarily a worsening of other development objectives, e.g. light weight, low fuel consumption, low exhaust emissions or operational safety and would take though combustion engine manufacturers completely out off business.

The new machinery directive emphasises the importance of ergonomics. Following the directive "…***discomfort, fatigue and physical stress faced by the operator must be reduced***…". Especially handheld products manufacturers face a strong pressure to reduce weight and improve ergonomic design in general. This means, that there is no option of adding extra weight for noise reduction actions while at the same time discomfort, fatigue and physical stress will increase. Noise reduction will always either increase weight and size of the machine or reduce performance which will lead to early fatigue.

Especially with products that have a high equipment population because they are used by hobby users, weight is a big issue, as these people are generally less physically trained compared with professional users. On the other hand professional users face relatively high working times that is why weight is a crucial factor, too.

To give a resume, noise reduction for handheld products is highly contradictory with the mandatory requirements of the machinery directive and others. This aspect has to be considered for these product categories. Noise reduction must not be achieved at the expense of users' health.

Recommendation:

An integrated approach especially for handheld products is necessary. The NOMEVAL report does not consider all aspects that are important for handheld products. The quality of the study for handheld products is therefore unsatisfactory and the findings and conclusions need to be revised. We propose that all aspects should be taken into account before noise emission limits for handheld products are recommended. Therefore we propose to revise the report. The new version should include technical feasible statements that take into account especially the technology shift driven by the exhaust gas regulation EU stage 2 (2002/88/EC) which is finally implemented 1 February 2008 (<50cc) and 1 February 2009 (<50cc).

Furthermore there analysis and the recommendation in the NOMEVAL report lead to a disproportional treatment of handheld machinery driven by internal combustion engines. Noise reduction measurements in this application area would cause a dramatic debasement of the

engine developments (weight and exhaust emissions) and would also cause enormous costs for research and development.

3.2 Typical handheld products and issue-related characteristics – correction proposal for the NOMEVAL report

The following text elaborates on some typical handheld machinery and its typical characteristics. Furthermore there are resulting recommendations and/or correction proposals for the NOMEVAL report:

- **Brush cutters:**
  - Area: rural use from professional users
  - Estimation: equipment population (EU): 182.000 instead of 2.000.000 (NOMEVAL)
  - Typical usage: 5 month; 10days; 180min run time. Average:150 hours/year
  - No tonality due to conversion to new technology in the future for EU II compliance
  - Due to the typical operation under load, the declared noise level is 2dB above operational speed (certification at racing only)
  - No battery systems available in this power class.
  - No technology solution serving both exhaust requirements and proposed noise limits available
  - **Recommendation:** to leave brush cutters in Article 13. No transfer to Article 12 because of low population and professional use as a forestry machinery with metal tools in rural areas. Sometimes brush cutters are used for highway service where other noise sources are dominant (cars, trucks, motorbikes, …).

- **Grass trimmers:**
  - Grass trimmers have to be divided into low power products for suburban and near housing area use and more powerful trimmers used in farming areas.
  - Grass trimmer (all types, farming, hobby, etc.) population: 5.400.000
  - Usage: 8 month, 2 days, 20 min. Average: 6 hours/year
  - Maximum sound power in practice: 110 dB(A)
  - Tonality depends strongly on working technique
  - Trend: More and more combustion engine powered trimmers are substituted by electric an battery powered products due to cost increase of EU stage II compliant engine technology
  - Market situation: Cheap importers have not been able to present EU stage II compliant engine technology, for this reason the expected trend will not occure in the near future
  - Technical progress: A minimum line speed is required to cut grass so that even improvements in engine technology would not necessarily reduce the operational noise level. Due to the introduction of low noise lines, an improvement of 2 dB(A) has been realized in the last years
  - Economic impact: dramatic cost increase, no hobby product available.
  - Research proposal: New cutting technology, compact engines are not quieter
  - **Recommendation:** to leave grass trimmers in Article 13. The operation noise is very dominant. No transfer to Article 12. Main noise source is the monofilament. Reduction in speed will reduce quality of cut.

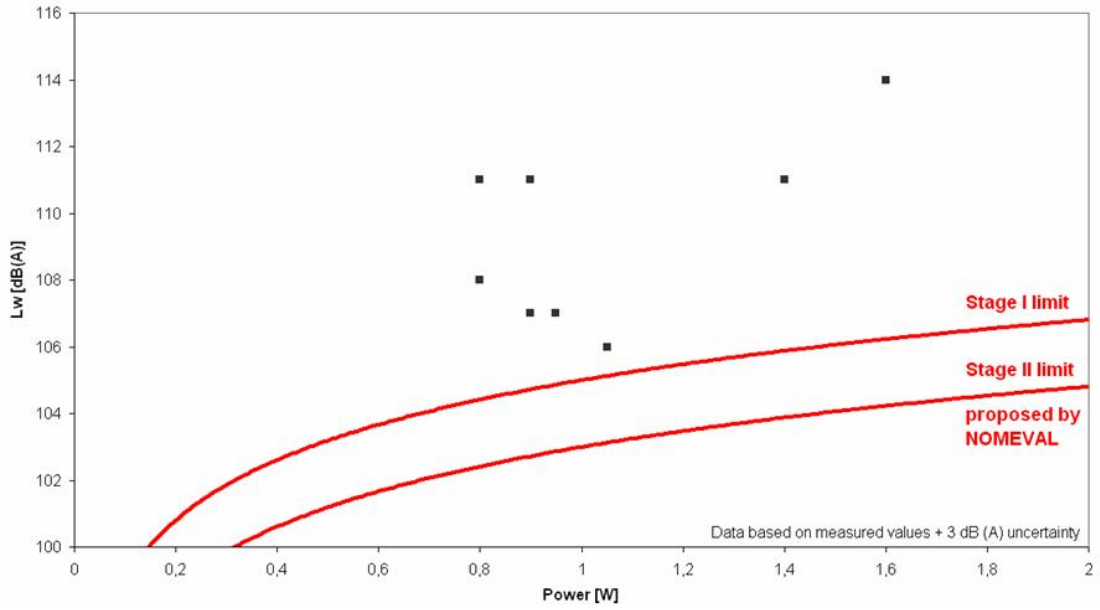

Figure 1: Sound power of brush cutter and grass trimmers (compliant to exhaust emission stage 2)

- **Chain saws:**
  - Categories need to be split up to technology sections (highly integrated equipment for wood cutting, pole pruners, stone saw) and users of these products (hobby, farming, professional)
  - Measurement method for outdoor noise overestimates the noise by 3 dB(A), real use has not 50% racing ratio.
  - Wood harvesting seasons are winter and early spring where most people are not affected.
  - Due to manufacturers data, there is no need to migrate chain saws into article 12
  - For hobby and professional chain saws, there is no technology available to meet the proposed noise limits.
  - Stone chain saws are only used in the Benelux area and is not known in other member states.
  - The market population for lawn mowers and chain saws is quite different and chain saw manufacturers would be happy if numbers were comparable
  - Economic impact of proposed limits would be: no product on the market available. SMEs only present on the European market need to close their business.
  - **Recommendation:** to leave chain saws in Article 13. No tranfer to Article 12. More specific analysis is necessary. Split into subcategories: professional and hobby. Professional chain saws are used mainly in rural areas. Only moderate population. Hobby chain saws are used only for very short time and not in urban areas. Further noise reduction is not feasible because of additional weight or reduced power. Limits will result in increase in industrial diseases because of additional weight.

Application	estimated equipmend population (EU)	Area of use	average operational lenght
hobby chain saw	8.200.000	rural	6 hours/year
professional chain saw	454.000	rural	150 hours/year
pole pruner	150.000	suburban, rural	3 hours/year
elctric chain saw	1.000.000	suburban	2 hours/year

Figure 2: Overview chain saw data in EU

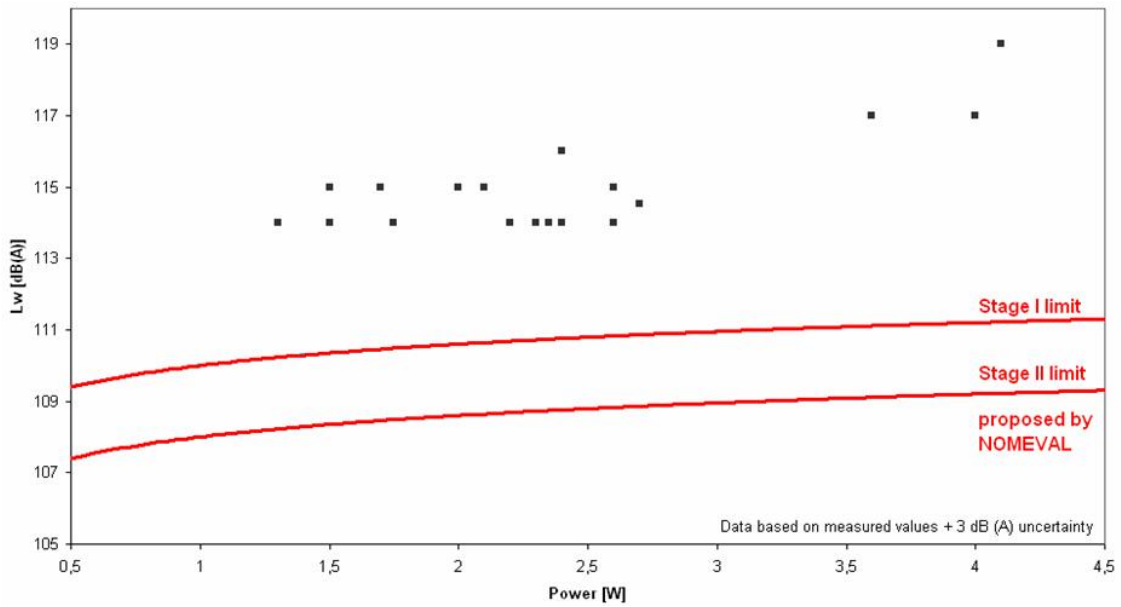

Figure 3: Sound power of chain saws (compliant to exhaust emission stage 2)

- **Hedge trimmers:**
  - Minimum two separate categories are needed (electric and ICE)
  - Typical el. hedge trimmer is used in urban and suburban areas 5 times a year from summer to autumn 30 min each.
  - Typical ICE hedge trimmer is used 5 times a year for about 1 hour.
  - Estimated population
    - Electric: 4.800.000
    - ICE: 190.000
  - Noise reduction options for hedge trimmers are limited due to noise from cutting attachment; products with high cutting performance will not meet the proposed noise limits.
  - No need to migrate ICE hedge trimmers to article 12 due to low population and neglectable environmental impact.
  - No product on the market that is compliant to exhaust emission stage 2.
  - **Recommendation:** to leave hedge trimmers in Article 13 as electric hedge trimmers. Operation noise is dominant, so no option for noise reduction necessary.

- **Lawn trimmers:**
  - Main noise source is cutting attachment within the cutting process. These products are mainly used for cutting grass in corners, along walls and fences, so the cutting line can not be encapsulated for noise reduction.
  - Technical progress: A minimum line speed is required to cut grass so that even improvements in engine technology would not necessarily reduce the operational noise level. The introduction of low noise lines has led to an improvement of 2 dB(A) to meet the current limit of 96 dB(A).
  - As the further noise reduction development has not been successful, the new noise limit has to be set at 96 dB(A).
  - Economic impact: European manufacturers dominate the upper power range quartile of this cost sensitive market. The proposed limits would eliminate these products.
  - There is no option to strengthen the limits.
  - **Recommendation:** not to change the current noise emission limit. Keep 96 dB(A). Main noise source ist cutting attachment. Low noise monofilaments have been introduced, so there is no further technical option to reduce cutting noise. Redcution

in cutting speed will lower cutting performance and increase working time with negative effect on both worker and environment

- **Leaf blowers:**
  - Two separate classes are needed (electric, ICE)
  - Usage: Urban, suburban
  - Estimated population
    - ICE: 290.000
    - Electric: 2.500.000
  - Professional use:
    - Backpack blower
    - Usage: 3 months, 90 hours/year
    - Parks, public areas, grave yards
  - Hobby use:
    - Hand-held blower
    - Electric: only hand-held
    - Usage: 3 months, 5 hours/year
    - Around dwellings
  - Technological progress: ANSI B175.4 defines low noise blowers with a equivalent level of 103 dB(A) for low noise products. The additional costs and reduction of blowing performance has to be taken into account.
  - The ANSI requirements are not mandatory to place products on the US market.
  - **Recommendation:** to leave leaf blowers in Article 13. No tranfer to Article 12 because of low population for ICE blowers. Lower noise emissions will result in higher weight and reduced blowing performance. Optional "low noise category" (not mandatory) for noise sensitive areas (hospitals, graveyards, …) following ANSI B 175.4.

- **Leaf collectors:**
  - No low noise ICE leaf collectors on the market.
  - No need for limits of ICE leaf collectors.
  - **Recommendation:** to leave leaf collectors in Article 13.

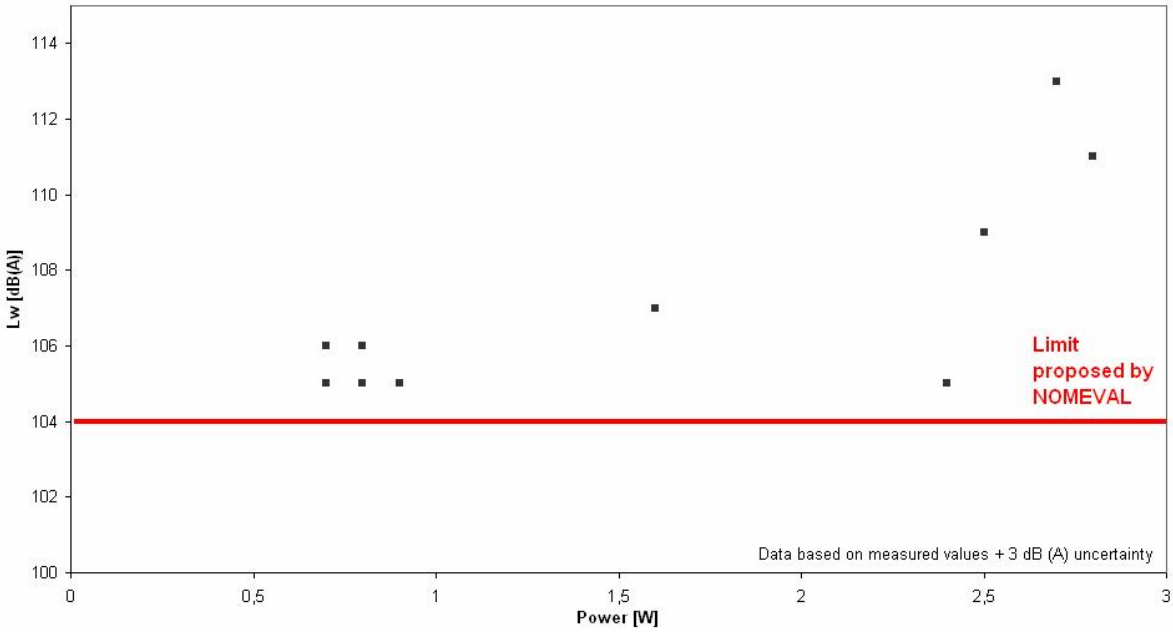

Figure 4: Sound power of leaf blowers and leaf collectors (compliant to exhaust emission stage 2)

- **Cut-off saws / Circular saws:**
  - Two separate categories
    - Handheld ICE
    - Hand fed saw benches
  - Cutting attachment: Diamond wheels and abrasive wheels only
  - For handheld products the usage time would be typically 12 months, 30 hours/ year
  - Test code for handheld is available since years ISO 19432.
  - For concrete and steel cutting with handheld cut-off saws there are no low noise blades available.
  - Typical users construction companies and rescue forces like fire brigades
  - No need to migrate handheld cut-off saws to article 12
  - **Recommendation:** to leave cut-off saws/circular saws in Article 13. Introduce separate category "cut-off machinery" ISO 19432. No limit because operation noise is dominant. EquipmentPopulation is low. No mix with hand fed saw benches. There are no low noise diamond or abrasive wheels available.

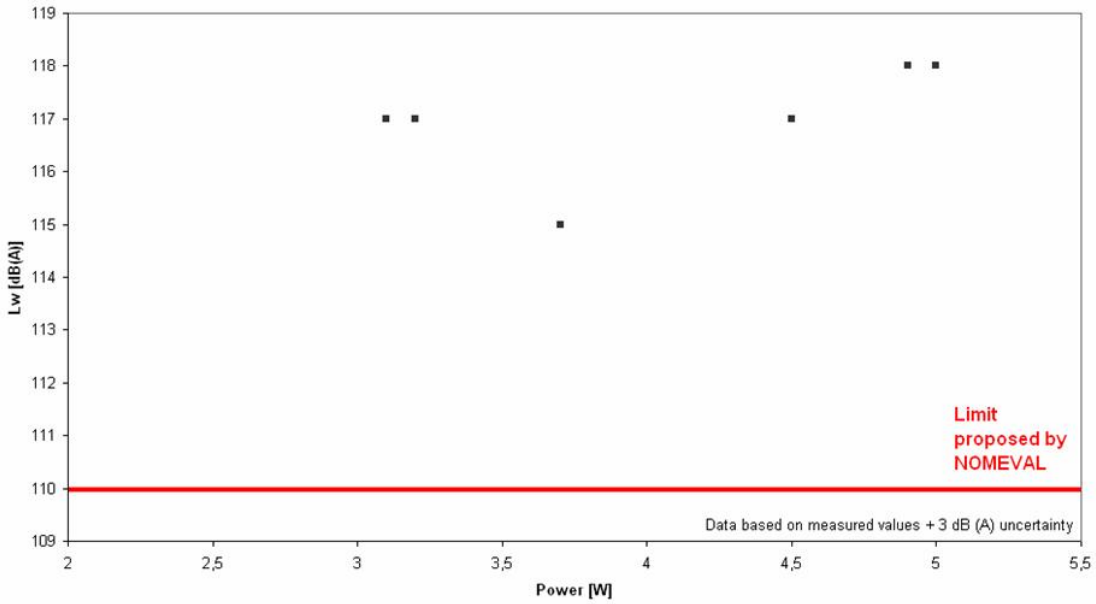

Figure 5: Sound power of new developed cut-off saws/circular saws (compliant to exhaust emission stage 2)

4. Lawnmowers

The recommended formula for the noise emission for lawnmowers that is proposed in the NOMEVAL report is L_{WAlim} = 71 + 15 * log L. An example shows that this formula has to be revised. A lawnmower with 122 cm cutting width would have to pipe down with 3 dB (old value 105, new value 102). BUT a lawnmower with a cutting width of 120 cm would be allowed to be 2 dB louder (old value 100, new value 102). That seems not to be logical. We propose a correction of the formule. Furthermore we recommend not th change the current noise limit values for lawnmower according to stage I.

5. Compaction machines

The NOMEVAL report states that the noise emission limits for compaction machines are as follows (see the follwing table). This is partially incorrect and has to be corrected.

P [kW]	sound power level [stage II]
≤8	105
8<P≤70	106
>70	86 + (11*lg P)

The footnote in the Directive 2005/88/EC states that the stage II noise emission limits for compaction machines are only merely indicative for machines with P>3 kW. That means that smaller engines with 3<P≤8 kW have to fulfil stage I limits according to the following table.

P [kW]	sound power level [stage I]	sound power level [stage II]
≤8	108	105
8<P≤70	109	106
>70	89 + (11*lg P)	86 + (11*lg P)

According to the NOMEVAL proposal the noise emission limit for compaction machines with 8<P≤70 kW is reduced to the value of 108 dB. Smaller machines with P≤3 kW could be louder. Instead of the stage II limit of 105 dB they would be allowed to have (108-1) db = 107 dB.

A reduction of 1 dB sound to be less. But we would like to remind that the manufacturers of compaction machines have already tremendous problems to fulfil the current limits. Therefore the stage II noise limit values came only into force for machines with P≤3 kW.

As these engines are only very few hours operated (<300 hours/year) we propose to refuse the recommended new noise limit values for compaction machines in the NOMEVAL report. The measures to further reduce the noise emissions are disproportional to the technical efforts.

Frankfurt/Main, 27 November, 2007

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