



NOMAD Phase 2 Report

Prepared by the NOMAD Task Force

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Contributing authors:

- Johanna Bengtsson Ryberg, Swedish Work Environment Authority, Sweden
- Paul Brereton, Health and Safety Executive, United Kingdom
- Fabian Heisterkamp, Federal Institute for Occupational Safety and Health (BAuA), Germany
- Jean Jacques, Direction Générale du Travail, Ministère du travail, France
- Jacqueline Patel, Health and Safety Executive, United Kingdom
- Alwin Verdaasdonk, Inspectorate Ministry of Social Affairs and Employment Manpower & Resources Directorate, The Netherlands

Contributing authors can be contacted by email at:

- NOMAD.Task.Force@hse.gov.uk
- Johanna.Bengtsson.Ryberg@av.se (Johanna Bengtsson Ryberg on behalf of NOMAD Task Force)
- noise-bruit1@outlook.fr (Jean Jacques on behalf of the NOMAD Task Force)

EXECUTIVE SUMMARY

Objectives

The **NO**ise and **MA**chinery **D**irective **T**ask **F**orce (NOMAD TF) was set up in 2012 under the auspices of the Machinery Directive 2006/42/EC (MD) Administrative Cooperation group in market surveillance (Machinery ADCO). The NOMAD TF was asked to address 8 Actions raised by the NOMAD survey carried out between 2008 and 2012, with the objectives of:

- Helping duty holders (manufacturers, suppliers, etc) and other stakeholders improve compliance with the noise requirements of the MD.
- Helping recipients of machinery noise information (buyers, labour inspectorates, market surveillance authorities, etc) make good use of it.
- Facilitating market surveillance within the European Union.
- Providing and improving tools and resources to help machinery manufacturers, buyers and market surveillance authorities address noise.

This report describes the work carried out by the NOMAD TF.

Background

Noise exposures are reducing but many workers remain exposed to high levels of noise. The number of people reporting noise induced hearing loss, according to statistics for individual Member States, is high and declining only slowly. Hearing disorders, as a result of occupational noise exposure, account for a very high proportion of reported occupational ill-health. Workplace noise legislation, requiring minimisation of noise exposure and management of the remaining noise risk, has been found sufficient to prevent hearing damage in workplaces with moderate exposure to noise. However, workers are highly reliant on hearing protection to control risk and noise risk from many new machines is higher than it needs to be. Identification of lower noise machinery requires much work by buyers.

Noise appears to have lost the attention of EU policy makers. There are practical problems with current noise legislation that require their attention.

Work of NOMAD Phase 1

The NOMAD Phase 1 survey (2008 to 2012) found 80% non-compliance with the noise requirements of the MD. At the time of the survey, manufacturers had to determine what was required from their reading of the MD or the national implementing legislation of Member States. A Guide to the application of the Machinery Directive was published in 2010 (the latest revision – Edition 2.2 - is dated October 2019 at the time of this report). This makes clear that machinery manufacturers must minimise noise risk through noise reduction at source and through use of protective measures with the support of noise emission declarations that: assist users to choose machinery with reduced noise emission; and are useful for the risk assessment to be carried out by employers under the Physical Agents (Noise) Directive 2003/10/EC (PAND).

Work of NOMAD Phase 2

The NOMAD TF has: produced guidance for manufacturers and users of noisy machinery; provided support to market surveillance activities; explored methods of finding appropriate harmonised noise test codes; investigated the value of noise emission data determined in accordance with noise test codes; and helped Notified Bodies produce a Recommendation for Use (RfU) consistent with NOMAD guidance.

The NOMAD TF organised a Workshop for noise stakeholders to discuss the implications of the findings against each of the 8 Actions set by the Machinery ADCO. Feedback from manufacturers, purchasers, enforcing authorities, notified bodies and others confirmed that all stakeholders had dealt with serious problems as a result of complicated legal requirements for noise and poor-quality noise information.

The work carried out by the NOMAD TF has raised the awareness of many stakeholders of the need for manufacturers and others to improve the reliability of noise information and for this to be used correctly by employers.

In addressing the 8 Actions, the NOMAD project has provided Machinery ADCO with deep insights into the achievements of noise stakeholders to date and the further potential to incentivise the minimisation of noise risk.

Dialogue between sellers, buyers and other noise stakeholders was found to be key to a successful Sell and Buy Quiet approach. But there is currently lack of a shared and correct technical understanding of: noise terminology; the legal requirements for noise; and the purpose and value of noise emission values provided in machine instructions.

Recommendations of the NOMAD Task Force

Machinery ADCO should create an environment supporting Sell and Buy Quiet through:

- Promoting the availability of quieter machinery.
- Promoting the availability and use of reliable manufacturers' noise data.
- Targeted market surveillance by appropriately trained market surveillance authority personnel that:
 - Incentivises reporting of reliable noise emission data.
 - Assesses the quality of noise emission data.
- Availability of noise test codes that are proven to provide information useful to noise risk assessments and comparison of the noise risk of competing machinery.
- Encouraging stakeholders to work together to correctly use appropriate noise test codes and collate and share noise emission data.
- Encouraging Notified Bodies to check for compliant noise information.

Machinery ADCO should encourage simple, clear noise legislation and standards by:

- Explicitly linking the MD requirements to minimise noise risk (Essential Health and Safety Requirement (EHSR) 1.5.8), the reporting of noise emissions (EHSR 1.7.4.2(u)) and the principles of safety integration (EHSR 1.1.2).
- Minimising conflict between the MD – driven by market forces – and the Outdoor Noise Directive 2000/14/EC (OND) – driven by noise limits.
- Ensuring noise test codes produce data that represent the noisiest operation in typical use, are helpful to purchasers' comparison of machine noise and useful to users' assessment and management of the associated noise risks.

National labour inspectorates and others should, through published guidance, assistance and enforcement, incentivise constructive dialogue on noise between manufacturers and buyers.

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INTRODUCTION

Objectives

1. The **NO**ise and **MA**chinery **D**irective **T**ask **F**orce (NOMAD TF) was set up in 2012 under the auspices of the Machinery Directive 2006/42/EC (MD) [1] Administrative Cooperation group in market surveillance (Machinery ADCO). The NOMAD TF was asked to address 8 Actions raised by the NOMAD survey carried out between 2008 and 2012 [2] with the objectives of:
 - a) Helping duty holders (manufacturers, suppliers, etc) and other stakeholders improve compliance with the noise requirements of the MD.
 - b) Helping recipients of machinery noise information (buyers, labour inspectorates, market surveillance authorities, etc) make good use of it.
 - c) Facilitating market surveillance within the European Union (EU).
 - d) Providing and improving tools and resources for machinery manufacturers, buyers and market surveillance authorities to help them comply with their duties.
2. This report describes the work carried out by the NOMAD TF against the 8 Actions set by the Machinery ADCO.

Background

3. Work carried out by the European Agency for Safety and Health at Work (OSHA) [3] showed that exposure to loud noise in Europe is not notably rising, but there are no significant improvements to be observed: 7% of workers self-reported hearing disorders due to their work and around 10% of workers were considered to be exposed (almost) permanently to noise “*so loud that they would have to raise their voice to talk to other people*”. Industry sectors where workers were affected by loud noise included construction, manufacturing of metal and wood, forestry, textile production and food production. Machinery typically used in these industry sectors, including food packing and processing machinery, compaction machines, edge-banding machinery, floor-cutting machines, transportable circular saws, and yarn twisting machinery [4], was considered to be a major contributor to significant workplace noise exposure. Although the OSHA study identified application of a range of different noise control measures, typically, control of noise risk in the workplace was heavily reliant on hearing protection.
4. Workers remain exposed to high levels of noise. For example, in Germany and Great Britain hearing disorders are still being reported as a result of this exposure [5], [6]. The statistics for individual Member States in Appendix A show that the number of people reporting noise induced hearing loss is high and declining only slowly. Hearing disorders, as a result of occupational noise exposure, account for a very high proportion of reported occupational ill-health. Lutman et al [7] investigated the effectiveness of noise legislation designed to minimise risk from occupational exposure to noise. The study showed that compliance with the requirements of European noise legislation could prevent hearing damage in workplaces with moderate exposure to noise. As with the EU-OSHA study however, participants were highly reliant on the use of hearing protection to control risk. Hearing protection programmes are known to be unreliable, for example, Brueck [8] found that only 60% of those reliant on hearing protection were receiving any protection.
5. The provision of hearing protection should not be used as an alternative to controlling noise by technical and organisational means. Instead, it is best used to control immediate risk while other protective measures are developed. Shanks [9] showed that in the printing industry, engineering noise control technology is less widely applied by manufacturers and employers

than it could be. There is no reason to suspect that this situation is any different to that in other noisy industries. Actual control of noise risk by employers is still over-reliant on the use of hearing protection. Action to encourage designers to design quieter machinery and purchasers to buy it would reduce this reliance on hearing protection for future generations of workers.

Applicable directives with noise requirements

6. The MD requires that noise risk is minimised, preferably at source, during design and construction (see Text Box 1). Potential for risk from noise may remain even when noise is minimized; the MD does not specify any limit values.

Text Box 1: Essential Health and Safety Requirement (EHSR) 1.5.8 of Machinery Directive 2006/42/EC

Machinery must be designed and constructed in such a way that risks resulting from the emission of airborne noise are reduced to the lowest level, taking account of technical progress and the availability of means of reducing noise, in particular at source.

The level of noise emission may be assessed with reference to comparative emission data for similar machinery.

7. A principle of the MD is that *'the essential health and safety requirements should be satisfied in order to ensure that machinery is safe; these requirements should be applied with discernment to take account of the state of the art at the time of construction and of technical and economic requirements'* (MD, Clause 14 of the Recitals). The MD sets out principles for safety integration (see Text Box 2). The Guide to the application of the Machinery Directive [10] makes clear that informing users about the necessary precautions and measures to be taken is a priority.
8. Noise emission data must be supplied with machinery when potential remains for noise risk. EHSR 1.7.4.2(u) specifies noise emission data that must be reported in the instructions. The provision of noise information that helps users to manage the residual risks associated with noisy machinery is essential to reduce the incidence of ill-health shown by the data in Appendix A.

Text Box 2: Extract from Essential Health and Safety Requirement (EHSR) 1.1.2 of Machinery Directive 2006/42/EC

- (a) Machinery must be designed and constructed so that it ... can be operated ... without putting persons at risk ...
- (b) ... the manufacturer ... must apply the following principles in the order given:
 - Eliminate or reduce risks as far as possible ...
 - Take the necessary protective measures ...
 - Inform users of the residual risks ...

9. For machinery designated as machinery for use outdoors in the Outdoor Noise Directive 2000/14/EC (OND) [11], the *sound power level* required by the MD must be supplied in

accordance with the OND. These machines must be labelled with the *guaranteed sound power level*; some of these outdoor machines are also subject to a limit value.

10. The Physical Agents (Noise) Directive 2003/10/EC (PAND) [12] requires that *'the employer shall give particular attention when carrying out the risk assessment to ... information on noise emission provided by manufacturers of work equipment in accordance with the relevant Community directives'*.
11. The NOMAD project has considered the quality and reliability of noise emission data that underpins the success of the European framework of noise regulation.

Applications of noise emission values

12. It is clear in the Guide to application of the MD, if not at EHSR 1.7.4.2 (u), that machinery manufacturers are required to provide noise emission declarations indicative of the potential for noise risk during normal use(s) of the machine, which:
 - a) Assist users to choose machinery with reduced noise emission; and
 - b) Are useful for the risk assessment to be carried out by employers under the PAND.
13. A Buy Quiet strategy requires comparison of machines from different manufacturers. Ideally this would be a comparison of all machine types capable of performing the task, for example in woodworking both nibblers and routers can be used for the same task; but in current practice it is usually limited to a comparison within machine families as defined in standards. Current noise test codes are not necessarily capable of facilitating comparison of similar machines from different families, for example due to different specifications of the operating conditions during the noise tests. Both the *emission sound pressure level* and the *sound power level* required by the MD should facilitate comparison of machines tested to the same noise test code.
14. Employers carrying out a risk assessment under the PAND seek information on the potential for noise risk and information on control of noise risk through correct installation, maintenance, operator training and hearing protection provision.
15. The complexity of using noise emission quantities to assess the risk is a matter for the employer and not the manufacturer. However, the manufacturer must make clear the potential for noise risk and how this can be controlled. A noise emission value representing noisiest typical use of the machine, as required by EN ISO 12001 [13], will give a clear indication of the potential for noise risk. Manufacturers and employers may benefit from noise information for common uses of the machine, which show the range in noise emission and not just the noisiest condition of use. The supplementary information on control of noise risk must be such that machinery can be operated safely regarding noise (EHSR 1.1.2).
16. The usability of noise emission values for risk assessment depends on how well these values represent noise emission in real operation. Real operation may involve process noise that is not covered, or not sufficiently or satisfactorily covered, by the noise test code. Real operation by the user may be with operating conditions that are not those specified in the noise test code, for example because they were not or could not be foreseen by the manufacturer.
17. Manufacturers' use of harmonised standards is optional but, where followed in full, these standards provide a presumption of the product's conformity with the EHSRs of the MD within the scope of the standard. Harmonised standards should provide clear instructions which, if followed in full, will deliver conformity with the MD.

NOMAD Task Force

18. The NOMAD project has comprised two phases to date.
 - a) Phase 1 of NOMAD was a pre-market surveillance survey [2] that found very poor compliance of the noise-related content (referred here as 'noise information', which includes noise emission data and instructions relevant to noise) of instruction manuals with the requirements of the MD (see Appendix B).
 - b) Phase 2 of NOMAD addressed actions recommended following Phase 1 to help all noise stakeholders (manufacturers, buyers, market surveillance authorities, Notified Bodies, etc) improve compliance with the noise requirements of the MD, such that the noise information provided in sales and technical literature and supplied with machinery is useful for:
 - Manufacturers to demonstrate the noise performance of their products against that of competitor products and the state-of-the-art (EHSR 1.5.8).
 - Market surveillance authorities to assess the noise performance of products with reference to comparative emission data for similar machinery and verify that they are compliant with the requirements to facilitate safe use of the machine regarding noise and to minimise noise risk, preferably at source (EHSRs 1.1.2 and 1.5.8).
 - Employers to address their responsibility under the PAND (see Appendix C) to assess and manage workplace noise making appropriate use of information provided by manufacturers.
 - Notified Bodies to verify that products requiring third party verification are supplied with information that facilitates safe use of the machine regarding noise.

The NOMAD Phase 1 Survey

19. The survey was carried out across 14 European Union and European Free Trade Association Member States between 2008 and 2012 by a Steering Committee comprising representatives from 9 Member States.
20. The Steering Committee coordinated the collection of noise information from more than 1500 sets of instructions, covering 40 different families of machinery from 800 different manufacturers. It was assessed against the noise requirements of the MD and the OND, which are summarised in Appendix B. The assessment covered:
 - a) The provision of numerical noise emission data, including uncertainty data.
 - b) The traceability of numerical data to a measurement method and operating conditions.
 - c) The credibility of numerical data with regard to the operating conditions under which they were obtained and as an indicator of potential for real use noise risk.
 - d) The provision of information on measures to protect against noise risk.
 - e) The provision of supplementary information on residual noise risk where the numerical noise emission data did not warn of noise risk.
21. The survey found 80% non-compliance of the instructions with the requirements for noise of the MD. Many examples of noise emission data provided in accordance with the appropriate harmonised standard did not comply. Common issues were noise emission values that did not represent potential for noise risk during the intended uses of the machinery and which could not help manufacturers, buyers, market surveillance authorities, etc assess the noise of similar machinery.

22. The NOMAD Phase 1 survey showed it is highly unlikely that buyers and users of machinery are able to make reliable decisions on machine noise based on the information contained in instructions. Information on the controls necessary to mitigate the risks from noisy machines was rarely provided in the instructions. The NOMAD Phase 1 project recommended to the Machinery AD CO, actions to support improved compliance with the noise requirements of the MD.

From NOMAD Phase 1 to NOMAD Phase 2

23. In 2012, Machinery AD CO set up a NOMAD TF and set 8 Actions aimed at improving compliance with the noise requirements of the MD. The NOMAD TF comprised representation from 7 Member States: France, Germany, the Netherlands, Poland, Spain, Sweden, and the United Kingdom (UK).
24. In June 2013, a Machinery AD CO workshop for all noise stakeholders took place in Brussels; it was sponsored by the European Commission. The workshop had about 100 participants, including machinery manufacturers or their associations, Notified Bodies, market surveillance authorities and labour inspectorates, health and safety professionals, standards writers, employers and trade unions. The event:
- Presented the findings from the NOMAD Phase 1 survey.
 - Identified possible reasons why only 20% of machinery instructions contained noise information that (mostly) met the noise requirements of the MD.
 - Raised awareness of the 8 Actions set by Machinery AD CO to improve the compliance with MD requirements of noise information provided in machinery instructions.

Phase 2 – The 8 Actions for the NOMAD Task Force

25. The 8 Actions set by the Machinery AD CO for the NOMAD TF are summarised in Table 1. The stakeholders expected to have most influence in successful completion of each action is listed. Progress, by 2019, against each of the 8 Actions is reported in Appendix D. A brief summary of the achievements to date is given in Table 1.

Table 1: A summary of the 8 Actions set by Machinery AD CO for the NOMAD TF

Action	Details	Stakeholders	Achievements
1	Raise awareness of machinery manufacturers of their legal responsibilities under Directives 2006/42/EC and 2000/14/EC through provision of information and enforcement.	Machinery AD CO, Member States, European Commission	The NOMAD Guide for Manufacturers published in 6 languages; freely available and widely distributed.
2	Raise awareness of machine buyers/users and the occupational safety and health (OSH) community of how noise emission information provided by machinery manufacturers can be used in a noise risk assessment required by Directive 2003/10/EC.	National OSH organisations/institutes, EU-OSHA Bilbao	The 2-page NOMAD Guide for Buyers – “Buy Quiet” Advice for buyers of machinery published in several languages; freely available and widely distributed.
3	Draft guidance “How to draft the noise content of instruction manuals” for specific machinery families.	Member States, national OSH organisations/ institutes, machinery manufacturers’ associations,	General guidance available in the Guide to the application of the MD and the NOMAD Guide for Manufacturers;

Action	Details	Stakeholders	Achievements
		CEN/CENELEC machinery safety technical committees, HAS noise consultants	guidance for specific families of machine is currently not a priority.
4	Set up a database for published harmonised noise test codes.	Machinery ADKO, CEN/CENELEC Management Centre (CCMC), HAS noise consultants	The European Commission maintains a list of current harmonised standards in the Official Journal of the European Union (OJEU). National standardisation catalogues and other databases (eg Perinorm and NoRA) are available.
5	Address issues identified with harmonised standards.	CCMC, national standardisation bodies (NSBs)	Issues were identified and analysed. Areas for progress have been highlighted.
6	Targeted market surveillance campaigns.	Machinery ADKO, Member States, European Commission	The NOMAD TF supported the noise component of a market surveillance exercise, JAMach14 on chain-saws.
7	Train market surveillance personnel.	Machinery ADKO, national labour inspectorates	The NOMAD Guide for Manufacturers provides examples of satisfactory noise declarations and a glossary of noise terminology; it could be used by market surveillance authorities.
8	Clarify the duties of Notified Bodies with regard to noise emission information provided with Annex IV machines.	Machinery ADKO, Notified Bodies under Directive 2006/42/EC	A Recommendation for Use (RfU) consistent with the guidance in the NOMAD Guide for Manufacturers has been produced for Notified Bodies; this has yet to be adopted (end of 2019).

26. The NOMAD Phase 2 work against each of the 8 Actions found that manufacturers, purchasers and enforcing authorities all had to deal with serious problems as a result of complicated legal requirements for noise and poor quality noise information. A NOMAD Workshop 2 was organised to discuss the implications of these findings with noise stakeholders before the publication of the NOMAD Phase 2 report. It was important to discuss the issues more widely as the success of future work depends on the commitment, collaboration and cooperation of several different stakeholders.

NOMAD WORKSHOP 2

Workshop format

27. The NOMAD Workshop 2 was held in Madrid in June 2019. Its purpose was to collect feedback from all noise stakeholder groups on a draft of this report. The stakeholder groups listed in Table 2 were invited; some delegates represented more than one stakeholder group. The stakeholders raised many issues outside of the 8 Actions set for the NOMAD TF and these will need to be addressed in the future.

Table 2: Workshop participants

Noise stakeholder groups	Number of representatives
Acousticians	1
European Commission DG Grow*	Letter of support provided (Appendix E)
Labour/enforcement inspectors	2
Machinery manufacturers	9
Machinery users/buyers	2
Market surveillance authorities	4
Notified bodies	2
Occupational safety and health advisers	7
Policy makers	1
Standardizers	2
Test Houses	0
Trade unions	0
NOMAD TF members	8

* Note: The European Commission's Directorate-General for Internal Market, Industry, Entrepreneurship and SMEs is responsible for EU policy on the single market, industry, entrepreneurship and small businesses.

28. NOMAD TF members introduced the NOMAD Phase 2 findings against the 8 Actions.
29. Noise stakeholders presented their views (both positive and negative) of noise legislation and compliance with the requirements, based on their experiences as manufacturers, employers, notified bodies, market surveillance authorities, enforcement officers, amongst others.
30. Stakeholder views were gathered from presentations, responses to poster questions, group discussions and from information provided on feedback forms.

Questions to encourage discussion

31. Delegates were asked the following questions:
- a) If you feel that you are lacking understanding about noise, what do you think you need to help you improve your understanding?
 - b) What conditions must be fulfilled for successful market surveillance regarding noise?
 - c) What conditions must be fulfilled for successful Selling Quiet?
 - d) What conditions must be fulfilled for successful Buying Quiet?
 - e) What conditions must be fulfilled for manufacturers' noise information to be useful to employers' risk assessment?
 - f) What are your expectations of noise standards?

- g) Do the noise standards meet your expectations?
 - h) Could Notified Bodies do more to help with supply of noise information that (i) helps compare machine noise; and (ii) assists with noise risk assessment?
 - i) What noise information should we expect from the Machinery Directive and what should we expect to be arranged between supplier and purchaser?
32. Delegates were invited to complete a feedback form that included the following questions:
- a) Do you have any comments on the work of the NOMAD TF in Phase 2?
 - b) Do you have different views on any of the topics discussed today?
 - c) On reflection, are there other topics that you would have liked to see discussed at the workshop?
 - d) In case Machinery ADCO decides to have a Phase 3 of NOMAD, what are your priorities?
33. Analysis of the stakeholders' views found suggestions for improvement around the following recurring themes:
- a) Incentives for manufacturing and buying quieter machines.
 - b) Clarification and simplification of noise legislation.
 - c) Improving standards for noise.
 - d) Securing improved compliance.

Workshop response to the NOMAD Phase 2 findings against the 8 Actions

34. The delegates welcomed the opportunity to discuss the findings of NOMAD Phase 2 with the NOMAD TF. The draft NOMAD Phase 2 report was generally well received by the stakeholders; they said it describes a great initiative with good intentions. Criticisms focused on slow progress against the actions set, limited representation of certain stakeholders within the TF (particularly users), not recognising the different approaches for products aimed at consumer and professional markets, and lack of progress made to produce a database of noise test codes. Concern was expressed at the apparent lack of follow-up with poor performers identified during NOMAD Phase 1. There has been support for, as well as criticism of, the NOMAD Guide for Manufacturers.

Workshop suggestions to incentivise manufacturing and buying of quieter machines

35. The main incentive for manufacturers, sellers and buyers to be interested in noise is legal requirement. The law requires manufacturers to reduce noise risk to a minimum (EHSR 1.5.8) but there is little enforcement and the absence of market demand for lower noise machinery has made noise a low priority for manufacturers. Buyers are not conscious of the harm caused by noise and the risks from noise (including the hidden costs of buying high noise machinery) go unnoticed. Buyers are unaware of alternative lower noise machines with comparable cost and performance and have not been persuaded to Buy Quiet.
36. Financial incentives should be considered, such as tax benefits for manufacturers selling quiet and renew/exchange schemes to encourage purchasers to buy quiet. Incentives rely on the availability of quieter machinery (with the same performance and cost) and noise information that reliably identifies quieter machinery. The inclusion of comparative emission data in standards should be considered.
37. Enforcement by Market Surveillance Authorities (MSAs) and labour inspectors should ensure that both manufacturers and employers meet their legal duties regarding noise. Successful

enforcement needs cooperation and coordination between Member States and adequately resourced MSAs. MSA staff should receive noise training and have access to acoustics experts.

38. Creating market demand should be tried, as a potentially more effective way than legislation, for encouraging supply of quieter machines.
39. EU-wide, EU-funded, stakeholder-focused 21st century media (social media, movies, apps, etc) campaigns should be used to promote incentives, such as:
 - a) Avoiding the serious health consequences of high noise exposure.
 - b) Easy identification of lower noise machines.
 - c) The benefits of buying quieter machines.

Workshop suggestions for clarification and simplification of noise legislation

40. The purpose and usefulness of the noise emission data required by the MD and the OND is not widely understood. The legal requirements for noise should be simplified; the noise information does not flow naturally between the MD and the PAND (or between the OND and the MD).
41. Stakeholders found that the many different noise quantities all in decibels, and subtle differences in the requirements and approaches of the MD, OND and PAND, required a deep understanding of noise.
42. Consideration should be given to having a single law for machinery noise and a single set of noise test codes, covering both the MD and the OND, to produce the required noise data.
43. The requirements of the MD should clarify, in simple non-technical language, the purpose and limitations of noise emission data so that the reasonable needs and expectations of the different stakeholders are fulfilled including:
 - a) Manufacturers – to design for low noise, to verify that low noise has been achieved and to alert purchasers to any remaining noise risk.
 - b) Buyers – to select lower noise machinery and to carry out occupational risk assessments.
44. Until the legal requirements for noise are clarified and simplified, understanding should be supported through guidance appropriate to the many stakeholders. Apps, databases, and other tools should be considered alongside access to existing stakeholder knowledge, including that of acoustics experts.

Workshop suggestions for improving standards for noise

45. Stakeholders were confused by the priority given to provision of noise data according to MD EHSR 1.7.4.2 (u) over the requirement to minimise noise risk according to EHSR 1.5.8.
46. Views differed on how the noise data produced according to EHSR 1.7.4.2 (u) can and should be produced and used. The situation was regarded as more complex for outdoor machinery when a different method must be used to determine *sound power level*.
47. Noise test codes should contain clearly defined operating conditions, which are realistic and representative. There is dispute over inclusion of workpiece noise as part of the manufacturers' assessment. A machine type should have only one noise test code.
48. The standards should contain clear requirements for noise declarations in user instructions; these should be easily comparable and useable by employers for their risk assessments under the PAND.
49. Standards should be zero cost because they are part of the law.

50. There should be guidance for standards makers and closer collaboration between standards makers, HAS consultants and users, to draft noise test codes that are understandable by experts, manufacturers and all stakeholders.

Workshop suggestions for securing improved compliance

51. Europe-wide market surveillance should ensure the noise requirements of the MD are met by all dutyholders, but MSAs must be skilled and confident in noise (and have access to technical support from noise specialists) before this can be achieved.
52. The European Commission should support and challenge the Notified Body system(s) to ensure that machines checked under this system are compliant with noise requirements. The benefits of accreditation of Notified Bodies under both the MD and OND should be considered. Notified Bodies cannot legally provide consultancy and in practice may have limited noise expertise.
53. Confidence in manufacturers' noise information should be boosted by third party certification of reliability similar to the German 'Blue Angel' scheme, which ensures high standards of environmentally friendly products.
54. There is a role for independent noise consultants to improve manufacturers' performance on noise through assistance with noise control, noise measurement and writing of noise test codes.
55. Manufacturers should be supplied with a checklist of physical noise controls.

Individual stakeholder suggestions for future action by the NOMAD TF

56. The Workshop participants were asked to provide suggestions for further work, should the Machinery ADCO decide to support a NOMAD Phase 3; their ideas included:
 - a) The NOMAD TF should propose revision of the noise clauses in the MD (and OND) to clarify and simplify the requirements for noise.
 - b) The NOMAD TF should initiate further market surveillance campaigns, addressing the common failings in noise information found in the NOMAD Phase 1 survey.
 - c) The NOMAD TF should complement its guides with state-of-the-art noise information by machine type and environment.
 - d) The NOMAD TF should conduct an interview-based stakeholder survey (qualitative) to establish the range of needs for guidance (and training) to help each comply with their duties under MD the OND and/or the PAND. Stakeholder groups should include labour inspectors (to help with estimates of noise exposure in workplaces to create an early demand for lower noise machinery) and MSAs (to help them carry out effective market surveillance).
 - e) The NOMAD TF should help national authorities to facilitate constructive dialogue between all stakeholders.
 - f) The NOMAD TF should propose ways of overcoming the difficulties arising from using different quantities to report noise emissions. An inventory should be made of current noise test codes for determining noise emissions and a priority list for revision and suggestions for new standards should be proposed.
 - g) The NOMAD TF should consult marketing experts to ensure messages on noise are appropriately drafted and targeted.
 - h) The NOMAD TF should verify the efficacy of Buy Quiet programs to reduce noise risk.

DISCUSSION

Progress of NOMAD TF against the 8 Actions

57. The actions set in 2012 for the NOMAD TF focused on the generation and use of noise information; particularly on the supply of reliable noise emission values with machinery such that manufacturers can Sell Quiet and buyers can Buy Quiet. The NOMAD TF was further tasked to support MSAs with targeted campaigns and training and with clarifying the duties of Notified Bodies in respect of noise information provided with Annex IV machines.
58. The NOMAD TF has made good progress against the action set to inform, promote and enforce manufacturers' compliance. The NOMAD Guide for Manufacturers has been well received by many as an aid to address complex requirements. A challenge by others that it requires more than the law is rejected.
59. The NOMAD TF has published the 2-page NOMAD Guide for Buyers – 'Buy Quiet'. It emphasizes the benefits of buying or hiring lower noise machinery and provides advice on how to meet legal duties. Buying Quiet is likely to be more successful if there are incentives for manufacturers to Sell Quiet and for purchasers to Buy Quiet, if there is increased confidence in the quality of available noise data, and if users are better able to use that data.
60. The support provided to MSAs by the NOMAD TF during the Joint Action on chain-saws (JAMach14), showed a need for noise expertise to assess the quality of noise information against the noise requirements of the MD. The required noise expertise existed in some MSAs but not others.
61. NOMAD TF discussions with associations of Notified Bodies suggest that while some have limited noise expertise others have none. Some Notified Bodies believe that the noise test codes for producing the required noise emission data (particularly for designated outdoor machinery) are not robust and that detailed checking of noise data is not worthwhile. This may explain why the NOMAD Phase 1 survey found noise data supplied with Annex IV machinery, required to be evaluated by Notified Bodies, was no better than that supplied with manufacturers' self-certified machinery. The Horizontal Coordination Group of the Notified Bodies in Europe produced a Recommendation for Use (RfU) sheet on noise emissions by the end of 2017, in consultation with members of the NOMAD TF. The RfU is not yet published (at the end of 2019).

Minimising the noise risk associated with noisy machines

62. The MD permits marketing of machines with high noise emissions so long as the noise is minimised at source, protective measures for noise are applied, and the buyer is informed by the manufacturer of the potential for noise risk. The information from the manufacturer should include, where relevant, how to manage the risk; for example by correct installation, use of hearing protection and operator training.
63. Many stakeholders who attended the NOMAD Workshop 2 did not understand that the MD noise emission values should allow the minimisation of noise risk to be assessed, through comparison with the noise emissions of similar machines as set out in EHSR 1.5.8 and elaborated in the Guide to the application of the MD.
64. There are examples where successive generations of machinery are quieter, for example battery powered garden machinery [14] and printing machinery [9], [15]. Some machines have been observed to be noisier than they need to be because they are supplied without noise controls, which are known to noise specialists but unused by manufacturers.

65. Factors other than noise must be considered when Buying Quiet, as was illustrated when considering the noise emission data supplied with a small sample of chain-saws. Evaluation of the manufacturers' data shows the difference in the *emission sound pressure level* of the noisiest and quietest chain-saws is around 21 dB – suggesting an opportunity to Buy Quiet if the user has no particular performance requirements [16].

A missing link – identification of quieter machines

66. Stakeholders at the NOMAD Workshop 2 stated that Buying Quiet can only be successful if buyers are aware of alternative lower noise machines with comparable cost and performance.
67. Noise emission data are required to appear in technical sales literature. Many stakeholders do not understand this noise information; many of those that do, have no incentive to use the information. Some stakeholders do not trust noise emission data for reliable comparison of competing machines, citing complex test standards and suspicions that operating conditions do not represent normal use of machines. These concerns were repeated at the NOMAD Workshop 2.
68. Action is required to restore confidence in manufacturers' noise information. A third party scheme for certifying reliability of noise data was proposed at NOMAD Workshop 2. Attention to the detail of any new third party scheme is needed to avoid repeating the problems with noise data allegedly checked by Notified Bodies (a third party).
69. MSAs could run campaigns to establish the state-of-the-art noise emission for specific types of machines. Making MSA findings widely known could encourage Buy Quiet for these machine types.
70. Making publically available state-of-the-art noise information by machine type and performance, as verified by physical testing, was suggested at the NOMAD Workshop 2. This is desirable but will require access to acoustics expertise and resources.
71. Some stakeholders suggested that Buying Quiet could be assisted by a reliable database (or smartphone app) of noise emission by product type. Maintaining and quality checking a database is necessary to avoid the problems observed with the OND database, which includes for example missing machines, missing or obviously incorrect data; this checking is resource intensive.
72. The NOMAD TF found that Buy Quiet is possible using manufacturers' noise emission data for chain-saws. This information can be used to identify the presence of noise hazard and to choose between products on the basis of noise.

Understanding of the noise requirements of Machinery Directive 2006/42/EC

73. The MD is a free trade directive that helps prevent safety becoming a barrier to trade, whilst requiring supply of machinery in Europe that can be used without risk. The noise requirements of the MD are clear when read together with the general requirements.
74. There is a perception among some noise stakeholders that the noise requirements of the MD are complicated. This perceived complexity and the low priority in the EU to address noise, become convenient reasons for inaction.
75. The NOMAD TF has found that while the requirement to minimise noise risk (EHSR 1.5.8) appears to be well understood by stakeholders, many are unsure what is needed to satisfy this requirement despite the availability of the Guide to the application of the MD and the NOMAD Guide for Manufacturers.
76. The role of the 3 measures of noise data required by the MD (EHSR 1.7.4.2 (u)) has generated much discussion among stakeholders, highlighting diverse views on their purposes. The Guide

to the application of the MD explains the purpose of the noise emission quantities, but does not explain how each quantity, for example the *sound power level* and *emission sound pressure level*, can be used. The NOMAD Guide for Buyers addresses this omission.

77. EN ISO 12001 is a standard providing rules for writers of noise test codes. It is widely recognised as a good document. It requires that the operating condition specified in a noise test code be reproducible and representative of the noisiest operation in typical usage. Neither the MD nor EN ISO 12001 is absolutely clear on the need for a workpiece during the test. A workpiece may be necessary to simulate the noisiest typical operating condition for some machines. Noise test codes simulating the noisiest operation in typical usage without a workpiece exist, for example the water brake for chain-saw testing; but this standard test is complex. It is in all stakeholders' interests to have the simplest possible noise test.
78. The rules of EN ISO 12001 allow for multiple operating conditions to be specified. Provision of noise data for operating conditions additional to the noisiest, for example when machines have a range of applications each with distinct but corresponding noise emissions, appears to be at the discretion of the standards writers and subject to the incentives for providing such data.
79. The approach of the MD, to produce noise data that can be compared to promote market forces for lower noise, is weakened by the OND approach to secure lower noise emissions through use of limit values. The conflict arises only for designated outdoor machinery and their *sound power levels*.
80. Dutyholders under the PAND (Article 4(6) (f)) "*shall give particular attention ... to information on noise emission provided by manufacturers...*" when carrying out a noise risk assessment to decide if there is a noise risk and how this should be controlled. For machines used in isolation the manufacturer's information alone may be sufficient, but more generally the dutyholder will need to decide if and how the new machine will require changes to the measures already in place to control the noise risks.

Simplification of the MD and its relationship with the OND and PAND

81. The relationship between the MD, the OND and the PAND is not obvious for all stakeholders. Many stakeholders wish to see noise data requirements that help the flow of noise data between the MD (and the OND) and the PAND.
82. There should be a single noise test code (and one set of operating conditions) for a given type of machine for both the MD and the OND to provide the required noise data (for example, see the suggestions from the ODELIA study [17]).

Market surveillance

83. Many stakeholders expect market surveillance and other enforcement on noise requirements to be a key incentive for manufacturers' production of lower noise machinery supplied with reliable noise information.
84. Successful and consistent Europe-wide market surveillance requires a shared understanding of the MD noise requirements by MSAs in all Member States. The NOMAD TF work on chain-saws during JAMach14 showed that most MSAs were equipped to challenge the absence of noise information, but few were equipped to challenge the quality and accuracy of noise information. An appropriate mix of training in noise and access to noise specialist advice is required: to fully understand the purpose of the required noise information; to identify appropriate standards providing the operating conditions; to assess the credibility of the reported noise emissions; and, ultimately, to decide if the risk from noise has been reduced to the lowest level.

85. When verifying that manufacturers have produced machines where the risks resulting from airborne noise emissions have been reduced to the lowest level, MSAs must only compare machines with similar performance characteristics.
86. Cooperation and coordination between Member States and the EU could optimise the efficiency of market surveillance and make best use of a combined MSA resource. Future collaborative market surveillance campaigns on noise might target machines that continue to present high noise risk in workplaces and address the common failings found during the NOMAD Phase 1 survey. Collaboration could include manufacturers, users, noise experts and other stakeholders to promote integration of appropriate proven noise controls into machinery in association with enforcement campaigns.

Incentives to improve action on noise

87. Noise is perceived as a low priority by many stakeholder groups, including policy makers, manufacturers and some Member States.
88. Many stakeholders expect market surveillance to establish reliable noise information and enforcement by labour inspectors in workplaces, to be key incentives for:
 - a) Manufacturers' production of lower noise machinery supplied with reliable noise information; and
 - b) Purchasers' identification of lower noise products and their management of any remaining noise risk.
89. Incentives for action by dutyholders rely on enforcement by the authorities, but there is little evidence of this.
90. Stakeholders have observed that the harm caused by noise is not highlighted as a problem by authorities and the risks from noise (including the hidden costs of buying high noise machines) go unnoticed. Buyers are unaware of credible alternative lower noise machines and have not been persuaded to Buy Quiet. Stakeholders lack confidence that suitable lower noise products can be reliably identified using manufacturers' declared noise emission data.
91. Methods of identifying and rewarding lower noise products could be investigated, including utilisation of the requirement for noise data to appear in the technical sales literature.
92. The ideas discussed for improving the quality of noise emission data have placed a high reliance on access to noise specialists and use of reliable noise data. Perhaps there is an opportunity to make more use of qualitative 21st century media. Marketing experts could be consulted to ensure that messages on noise are appropriately drafted for the target audiences.
93. Noise expertise could be used to help the European Commission support and improve the Notified Body system(s); to ensure machines assessed by Notified Bodies are supplied with noise information that is compliant with both the MD and the OND and useful to those with duties under the PAND.
94. Notified Bodies should have knowledge of those noise test codes that are effective and those that are defective. The NOMAD TF would encourage Notified Bodies and others to report weaknesses in standards to their national standards bodies.

CONCLUSIONS AND SUGGESTED ACTIONS FOR THE FUTURE

95. Experience, evidence, achievements and challenges allow the NOMAD TF to state that:
- a) The actions carried out in the NOMAD project have provided Machinery ADKO with deep insights into achievements to date and the further potential for manufacturers' noise emission data to incentivise the minimisation of noise risk. The NOMAD TF has produced guidance for manufacturers and users, provided support to market surveillance activities, and investigated the noise emission data determined in accordance with harmonised noise test codes.
 - b) It is not clear if, or how, the surveys and stakeholder interactions carried out and guidance produced by the NOMAD TF have secured improvement of the quality of the noise content of machine instructions or inspired production of lower noise machines. The work carried out by the NOMAD TF has raised the awareness of many stakeholders of the need for manufacturers to improve the reliability of noise information and for this to be used correctly by employers.
 - c) Noise risk at work continues to cause harm to workers. Reducing machine noise is possible and necessary, as is the availability of improved noise data, to prevent this harm. The continuation of the work of the NOMAD TF will help resolve these problems.
 - d) The continuity of the work carried out by the NOMAD TF over a number of years shows that there has been a sustained interest among few but determined Member States.
 - e) Creating the conditions that will increase the supply of machinery with lower noise risk is a key objective for the future. Improving the availability of noise emission information, which has the respect and support of machine users and manufacturers, is an important step towards trade in machinery with lower noise risk.
96. More work is required to achieve the NOMAD objectives of encouraging manufacturers' compliance with MD noise requirements, such that buyers can consider noise risk and its management as part of the procurement process. Achieving the NOMAD objectives requires sustained pressure and support for improvement over a long period of time. The story continues.
97. Actions suggested for the future are focused on the two following complementary key objectives:
- a) **Objective A - Make Sell and Buy Quiet a reality.**
 - b) **Objective B – Pursue clear, simple future EU legislation** (and EN harmonised standards) on machinery noise (taking advantage of the imminent revisions of the MD and the OND).

Objective A – Make Sell and Buy Quiet a reality

98. There are a number of actions that can be taken to create the incentive to Sell Quiet and Buy Quiet. Incentives to Sell Quiet include:
- a) **Market surveillance pressure on manufacturers through joint EU targeted action to address the minimisation of noise risk for chosen families of machinery. Actions could be focused on the quality of sales literature, with enforcement actions taken against poor performers.**
 - b) **Improving the confidence and competence of MSA personnel on noise and the legal requirements for noise. Machinery ADKO may want to consider organising an EU-wide seminar for MSA personnel on noise.**
 - c) **Encouraging those who draft Type-C standards to:**

- Improve the quality of Type-C standards regarding the information for use, by giving examples of good noise emission declarations.
 - Provide information that will help the user to assess the noise risk.
 - Provide comparative values of noise emission in the Type-C standards.
- d) Inviting manufacturers' associations to help their members to:**
- Sell Quiet through correct use of the appropriate noise test codes.
 - Create, maintain and share noise emission databases.
- e) Promoting the NOMAD Guide for Manufacturers and updating it, if necessary.**
- f) Encouraging Notified Bodies to contribute to the Sell Quiet objective.**
- g) Organising national enforcement campaigns aimed at:**
- Securing improved manufacturer compliance with the noise requirements of the MD.
 - Promoting the availability of quieter machinery.
- h) Creating training aids for market surveillance personnel** (for example, powerpoint presentations and on-line learning packages) to help them better understand the legal requirements for noise and providing examples of compliance and non-compliance.
- i) Evaluating and reporting the reliability of manufacturers' noise declarations for identifying quieter machines and for reporting the potential for noise risk.**
- j) Reviewing the reliability of harmonised standards for determining noise emission data for machine families and, if necessary, revising these standards.**
99. Incentives to Buy Quiet include:
- a) Informing purchasers that they have a choice to buy lower noise machinery, with comparable performance.**
 - b) Increasing the confidence of purchasers in the reliability of manufacturers' noise emission data.**
 - c) Helping users understand how manufacturers' noise information can be used to select lower noise machines, which they should be doing to control noise risk.**
 - d) Promoting use of the NOMAD Guide for Buyers across the EU.**
 - e) Helping users to bridge the gap between noise emission data and risk assessment at the workplace.**
100. There are a number of ways of creating the incentive for those selling and buying noisy machinery to discuss noise including:
- a) Encouraging dialogue between all stakeholders when Type-C standards are drafted or revised.**
 - b) Encouraging and helping authorities and employers to review and improve manufacturers' performance on noise.**
 - c) Encouraging and helping authorities and trade unions to review and improve employers' performance on noise.**
 - d) Encouraging and supporting stakeholders to report problems with noise test codes to CEN or CENELEC.**
 - e) Organising communication campaigns as needed to ensure sellers and buyers keep addressing noise.**

- f) **Organising a joint action (market surveillance campaign)** to investigate the noise from a medium-sized, moderate cost production machine family, which should include:
- A review of the credibility of the noise emission data provided in sales literature describing the performance characteristics of the chosen machine family.
 - An evaluation of the noise hazard during the noisiest operation(s) in typical usage generated by a sample of the machine family.
 - A review of the noise content of the instructions and, for poor performing machines, the technical file.
 - Enforcement action against poor performers (manufacturers and suppliers).
 - Disputing standards that provide poor or unreliable noise emission data in accordance with Article 10 *Procedure for disputing a harmonised standard* of the MD.
 - Publicising the scope to Sell Quiet and Buy Quiet, based on noise emission data supplied by manufacturers of the chosen machine family.

Objective B – Pursue clear, simple future EU legislation on machinery noise

101. The NOMAD TF recommends improving noise legislation and standards by:

- a) Using experience the NOMAD TF has gained on the noise requirements of the MD and the OND during the imminent revisions of these Directives.
- b) Minimising the conflict between the MD which is led by market forces and the OND which is led by noise limits.
- c) Revising the MD and the OND to help promote the Sell and Buy Quiet approach.
- d) Making clear the purpose of each noise quantity required by the MD and the OND.
- e) Ensuring that the noise emission data required by EHSR 1.7.4.2(u) of the MD:
 - Can be used to help choose machinery with reduced noise emission; and
 - Provide information that is useful for the risk assessment to be carried out according to the PAND.
- f) Ensuring that those noise test codes, which produce noise emission data that do not represent the noise emission during the noisiest operation in typical use, require the provision of supplementary information to help machinery users assess and manage the associated noise risks.

102. The NOMAD TF recommends a policy for revising the MD and the OND shared by the Machinery and Noise ADCOs that:

- a) Refines the relevance and practicality of the noise requirements of the MD and the OND, with the aim of clarifying and simplifying the noise requirements of the MD (and its harmonised standards) to promote:
 - The design and construction of machinery with minimised noise risk.
 - The provision of noise emission data that report noise risk.
 - The provision of information on how to use the machine with minimised noise risk.
- b) Sets the ultimate goal of successful application of the noise requirements of the revised Directives, without the need for additional guidance, for example the Guide to the application of the MD, the NOMAD Guide for Manufacturers, the OND position paper [18].

- c) **Encourages the European Commission to have a single EC Working Group that addresses noise for both the MD and the OND.**
- d) **Creates a legislative framework that allows, for machinery covered by the OND, the use of a single noise test code for both the MD and the OND.**

103. The revised MD and OND should encourage the Sell and Buy Quiet approach.

**THE NOMAD TF PROPOSES A NOMAD PHASE 3
TO ACHIEVE THE OBJECTIVES THAT HAVE BEEN SUGGESTED HERE.**

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2008 – 2012: NOMAD Phase 1 – The survey

Countries and Steering Committee members that contributed actively to data gathering and processing:

Denmark: I Gybel-Jensen (Danish Working Environment Authority)

Finland: P Lankinen, K Tytykoski (STM)

France: J Châtillon, G Jeanjean, J Jacques (INRS) and C Maujean (DGT, Ministry of Labour)

Germany: L Finkeldei (UMBW), P Kurtz (BAuA)

Poland: M Szyszko (OIP-National Labour Inspectorate)

Spain: B Juan y Seva Guevara, J Virto (INSST)

The Netherlands: B Kamerling, D Korver (Inspectie SZW)

United Kingdom: J Patel, T Ward (HSE)

Other countries that contributed to data gathering:

Cyprus, Ireland, Lithuania, Norway, Romania

2013 – 2019: NOMAD Phase 2 – The 8 Actions

Task Force members:

Denmark: N O Olesen (Danish Working Environment Authority) until 2014

France: J Jacques and successively C Maujean, B Gaigé and B Caraud (DGT, Ministry of Labour)

Germany: F Heisterkamp from 2017, P Kurtz until 2018 (BAuA)

Norway: B Lerstad (Arbeidstilsynet) until 2015

Poland: M Szyszko (OIP-Labour Inspectorate) until 2016

Spain: B Juan y Seva Guevara (INSST) until 2019

Sweden: S Nygard until 2016, J Bengtsson-Ryberg from 2017 (SWEA- Arbetsmiljöverket)

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APPENDIX A: MEMBER STATES' OCCUPATIONAL NOISE STATISTICS

104. Figure A1 gives some of the reasons why it is important to address workplace noise; exposure to noise can have a negative impact on both the health and safety of workers.



Figure A1: Health and safety risks associated with exposure to noise

105. Annual statistics produced by Member States show the impact of occupational exposure to noise on worker's health. Figure A2 provides statistics showing the numbers of reported hearing damage in those Member States currently represented on the NOMAD TF, that is France, Germany, the Netherlands, Spain, Sweden and the UK.

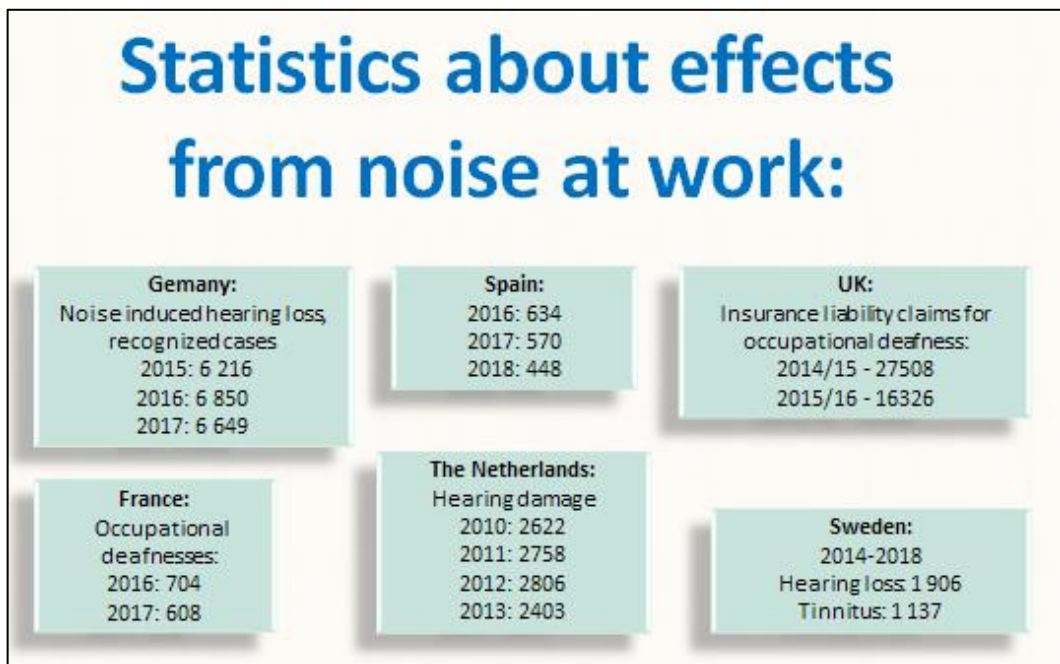


Figure A2: Statistics showing different styles of reporting hearing damage in Member States

106. Although different countries report different quantities, and apply different rules when deciding on which levels of hearing damage to report, the data in Figure A2 show that hearing disorders are still being reported as a result of exposure to noise at work.

107. In the UK, the number of workers with work-related hearing problems was estimated to be 21,000 between 2016/17 and 2018/19. There were 55 new claims for very severe work-related deafness in 2018 (at least 50 dB loss in both ears) (<https://www.hse.gov.uk/statistics/causdis/deafness/index.htm>) (accessed January 2020) (see Figure A3).

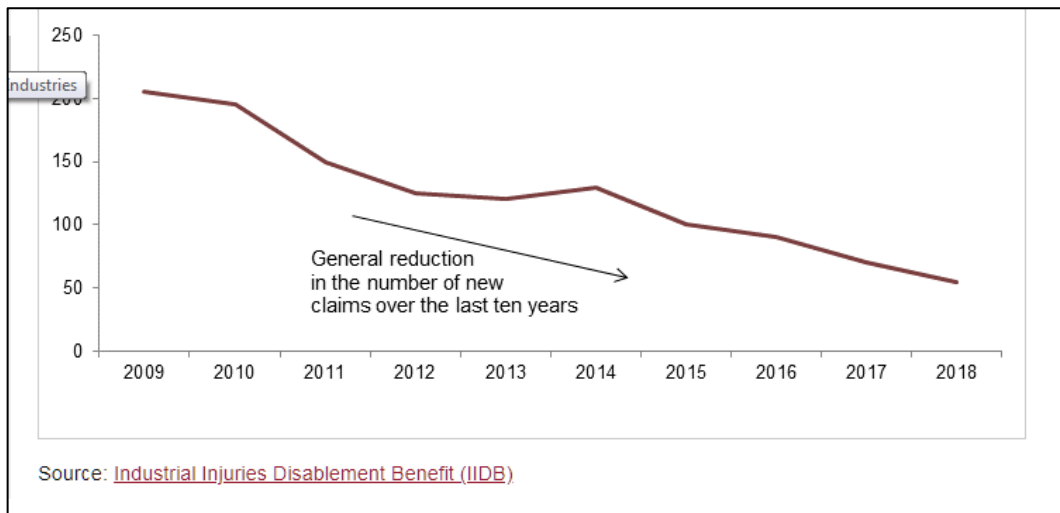


Figure A3: New claims for work-related deafness in UK (2009-2018)

108. Figure A4 shows the data for noise induced hearing loss reported in Germany. It shows the number of cases, with a decline only in the number of new occupational disease pensions. There has been no decline in the number of notifications of a suspected occupational disease or newly recognised cases of an occupational disease. An explanation of the terms and definitions used in Figure A4 can be found at <https://www.dguv.de/en/facts-figures/definitions-terms/index.jsp>.

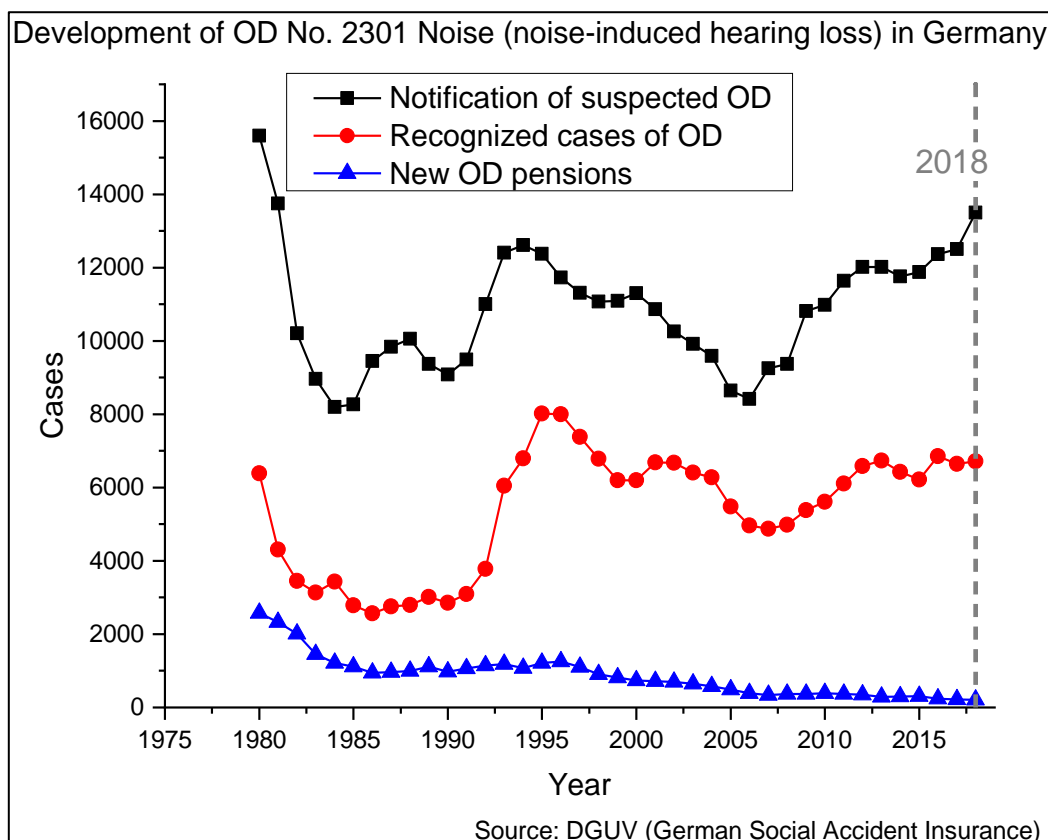


Figure A4: Noise induced hearing loss data in Germany (1975 – 2018)

109. Data from both Germany and the UK suggest that reported cases of hearing damage are declining slowly. Very severe hearing loss is close to being eliminated, but hearing damage still accounts for a very high proportion of reported occupational ill-health and claims for occupational ill-health.
110. Figure A5 shows that noise induced hearing loss (Occupational Disease Number 2301, OD-No. 2301) is the most frequently recognised occupational disease in Germany - among all occupational diseases and also among those that are caused by physical impact. Noise still poses a major problem for Occupational Health and Safety in Germany (<https://www.dguv.de/en/facts-figures/ods/recognized-od/index.jsp>).

Figure A6 shows a similar situation in the UK; claims for noise induced hearing loss account for 68% of the top 10 insurance liability claims.

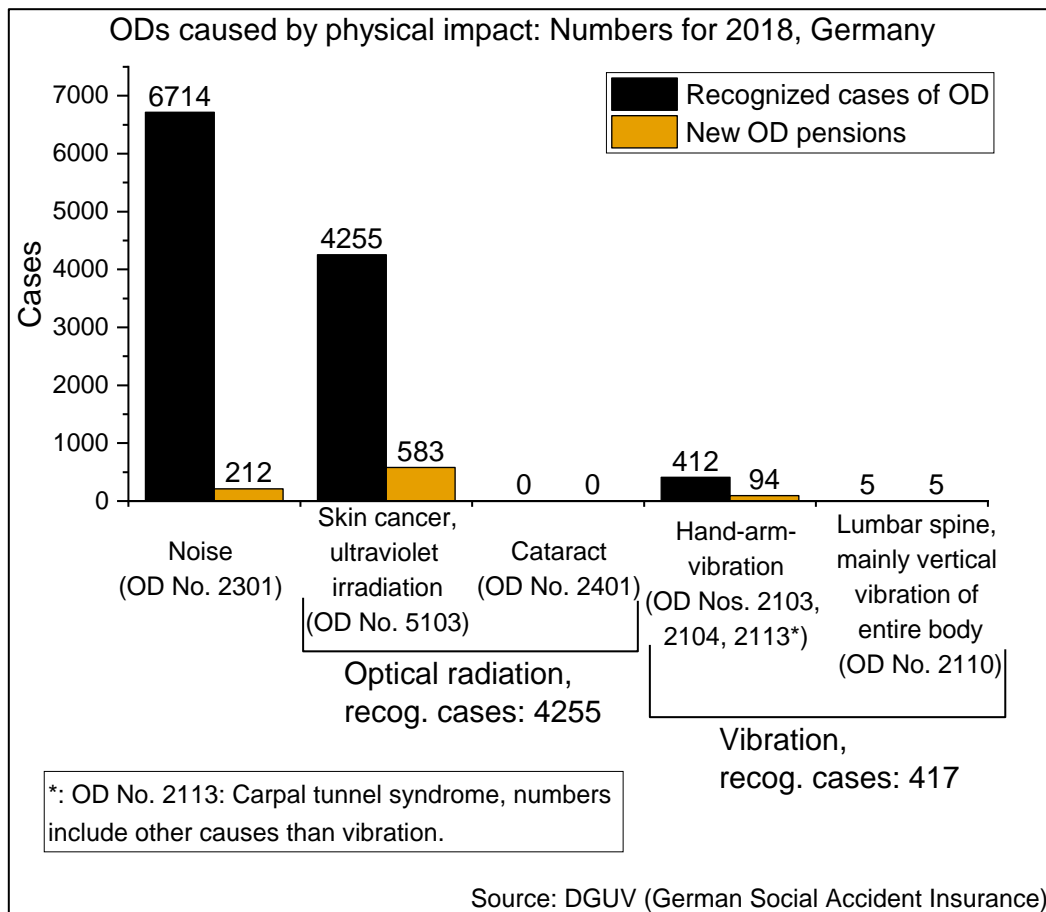


Figure A5: Recognised cases of occupational disease in Germany

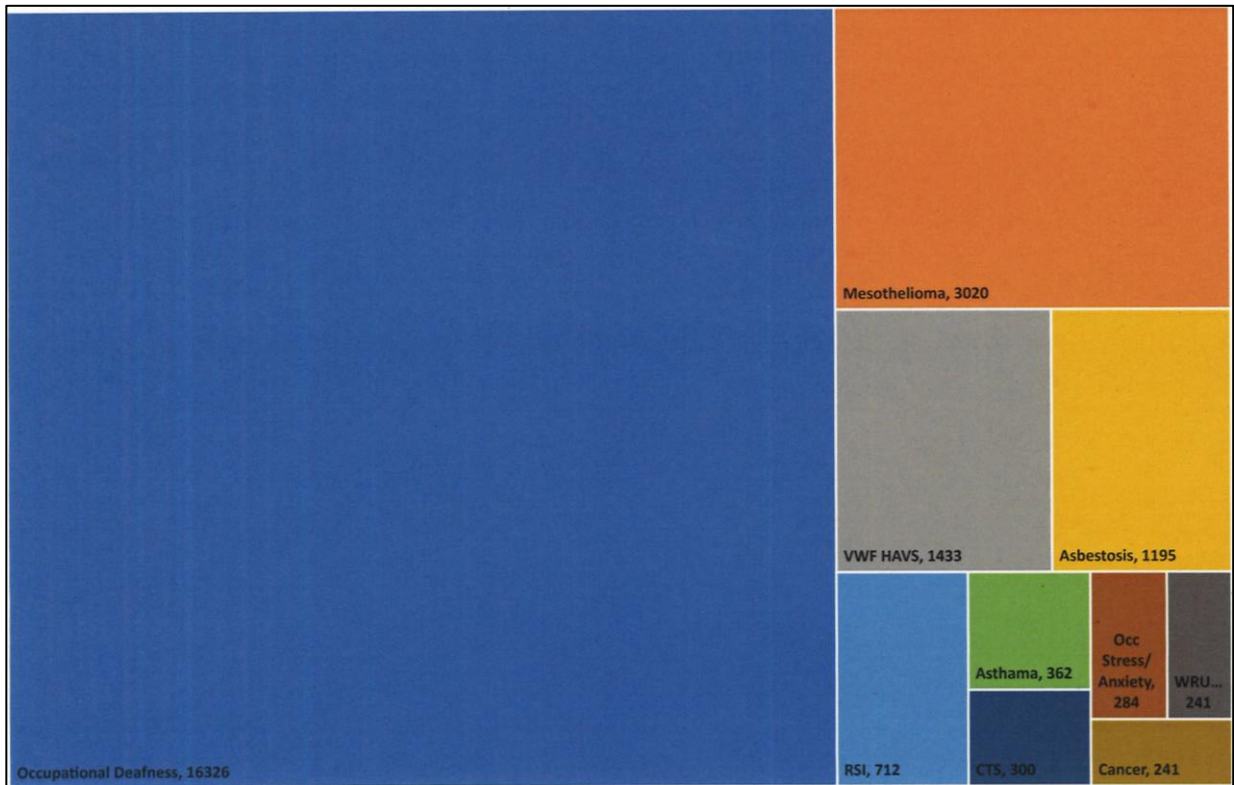


Figure A6: Top 10 insurance liability claims in the UK (health only) 2016

APPENDIX B: MANUFACTURERS' DUTIES UNDER DIRECTIVES 2006/42/EC AND 2000/14/EC ON NOISE

EHSR/ Article	Description
MD 1.1.2	Principles of safety integration
MD 1.1.7	Protection against hazards at operator positions
MD 1.5.8	Risks from emission of airborne noise reduced to the lowest level Level of noise emission assessed with reference to comparative emission data.
MD 1.7.1	Information and warnings on the machinery
MD 1.7.4.2 (j)	Instructions relating to installation and assembly for reducing noise or vibration
MD 1.7.4.2 (k)	Instructions for putting into service and use of the machine, and if necessary, instructions for training operators
MD 1.7.4.2 (l)	Information about residual risks
MD 1.7.4.2 (m)	Information on protective measures including personal protective equipment (hearing protection)
MD 1.7.4.2 (n)	Essential characteristics of tools that may be fitted to the machine
MD 1.7.4.2 (r)	Maintenance measures
MD 1.7.4.2 (u)	Information on airborne noise emissions: <ul style="list-style-type: none"> ○ <i>Emission sound pressure level</i> L_{pA} and uncertainty K (MD); ○ <i>Peak instantaneous sound pressure level</i> L_{CPeak} (MD); and ○ <i>Sound power level</i> L_{WA} and uncertainty K (MD). <p>Note: for designated outdoor machinery the OND applies and the MD requirement for <i>sound power level</i> is replaced by the OND requirement, that is, measured and guaranteed L_{WA}</p>
MD 1.7.4.3	Noise emission values in sales literature
MD Article 5(1)(e), Annex II	EC Declaration of Conformity to accompany machine
MD Article 5(1)(f), Annex III	CE marking on the machine
OND Article 4(1), Annex II	EC Declaration of Conformity to accompany machine
OND Article 4(1), Annex IV	Pictogram showing guaranteed L_{WA}

**APPENDIX C: EMPLOYERS' DUTIES UNDER DIRECTIVE 2003/10/EC ON
MANUFACTURERS' INFORMATION**

Article	Description
4(6)(f)	Pursuant to Article 6(3) of Directive 89/391/EEC*, the employer shall give particular attention, when carrying out the risk assessment, to information on noise emission provided by manufacturers of work equipment in accordance with the relevant Community directives
5(1)(b)	The reduction of [noise] risks shall be based on the general principles of prevention set out in Article 6(2) of Directive 89/391/EEC, and take into account in particular: the choice of appropriate work equipment, taking account of the work to be done, emitting the least possible noise, including the possibility of making available to workers work equipment subject to Community provisions with the aim or effect of limiting exposure to noise
5(1)(d)	The reduction of [noise] risks shall be based on the general principles of prevention set out in Article 6(2) of Directive 89/391/EEC, and take into account in particular: adequate information and training to instruct workers to use work equipment correctly in order to reduce their exposure to noise to a minimum
5(1)(f)	The reduction of [noise] risks shall be based on the general principles of prevention set out in Article 6(2) of Directive 89/391/EEC, and take into account in particular: appropriate maintenance programmes for work equipment,.....

* COUNCIL DIRECTIVE of 12 June 1989 on the introduction of measures to encourage improvements in the safety and health of workers at work (89/391/EEC)

APPENDIX D: PROGRESS BY NOMAD TF AGAINST THE 8 ACTIONS SET BY MACHINERY ADCO

ACTION 1 – RAISING AWARENESS OF MACHINERY MANUFACTURERS AND RELATED STAKEHOLDERS

NOMAD Phase 1 observations on machinery manufacturers' compliance with the MD

111. The NOMAD Phase 1 survey found that there has been a widespread failure (80% non-compliance) of manufacturers to satisfy the MD requirements on noise (see Appendix B) in the instructions for their machinery [2]. In doing so, manufacturers are in breach of the MD and impede employers' effective prevention of ill-health caused by exposure to noise at work according to PAND [12] (see Appendix C).
112. The NOMAD Phase 1 report observes for machine instructions, *'it is clear that the cause of non-compliance in the majority of cases is not simply the absence of any information or an incomplete set of numerical values'*. Another observation in the report is that, *'Instructions were often found to be not compliant for a combination of reasons'*.
113. The main reasons noise information did not meet the requirements of the MD were:
 - a) Some or all of the required numerical values relating to noise emissions were missing.
 - b) Noise emission values were not traceable to machine operating conditions and/or measurement methods.
 - c) Noise emission values were not credible either against the stated operating conditions and/or measurement method or as warnings of likely risk from noise during the intended use of the machine.
 - d) The noise terminology used was imprecise making the numerical values unclear or unusable, for example using *noise level* or *sound exposure* in place of the required specific quantity such as *emission sound pressure level* or *sound power level*.
114. The NOMAD Phase 1 report suggested *'two possible underlying reasons [for non-compliance] are: (i) a lack of knowledge among machine suppliers, for example, knowledge of legal requirements, knowledge of machine safety standards or noise test codes, knowledge of technical issues around noise or technical know-how in applying or following test codes, and (ii) a lack of care among machine suppliers, caused by the lack of commercial incentive to comply (quieter machines or those with better instructions not gaining market share), no fear of enforcement action and/or reputational harm, or simply that noise and damage to hearing is not considered a significant risk'*.
115. Many of the failures identified by NOMAD Phase 1 are easy to correct. Examples include:
 - a) Ensuring the traceability of declared noise emission data by providing a full reference to an appropriate harmonised standard/noise test code (including part number and date) or by reference to the measurement method and operating conditions used to determine the noise emission data.
 - b) Ensuring numerical values in instructions are described correctly, for example *emission sound pressure level* and not *noise level* or *sound exposure*.
116. The NOMAD TF concluded that many of the failings observed during NOMAD Phase 1, which lead to Action 1 *to raise the awareness of machinery manufacturers of the noise requirements of European legislation, their legal responsibilities and the resources available to support them*, could be addressed through guidance on noise for manufacturers etc to complement existing guidance on the MD.

Difficulties in providing reliable noise data

117. The Guide to the application of the MD [10], which makes clear the purpose of noise information supplied with machinery according to Directive 2006/42/EC, was published first published in 2010 (the latest revision is dated October 2019 at time of this report). The NOMAD Phase 1 collection of instructions took place between November 2009 and January 2011. As such, it is likely that at least some of the instructions reviewed were prepared without the benefit of the Guide to the application of the MD and contained data gathered without the benefit of standards prepared according to the rules for noise test codes [13].
118. Machinery manufacturers must understand when the following quantities need to be reported:
- a) MD requirements:**
- *Emission sound pressure level, L_{pA}* when 70 dB(A) threshold is exceeded and its uncertainty, K_{pA} ;
 - *Peak sound pressure level, L_{pCpeak}* when 130 dB(C) threshold is exceeded; and
 - *Sound power level, L_{WA}* when the L_{pA} exceeds 80 dB(A) threshold and its uncertainty, K_{WA} , except for designated outdoor machinery.
- b) OND requirements for designated outdoor machinery:**
- *Measured sound power level (L_{WA});* and
 - *Guaranteed sound power level (L_{WA}).*
119. The NOMAD TF identified a number of areas where manufacturers might benefit from help, additional to that given in the MD and the Guide to the application of the MD. These were:
- a) Reliability of noise test codes.
- b) Application of data by users/buyers.
120. The NOMAD TF considered that the Guide to the application of the MD made clear what was expected by the MD and harmonised standards provide methods of producing the noise data. They agreed to produce additional guidance for manufacturers, which set out how to produce good noise information addressing both the general and specific requirements concerning noise.
121. Misunderstanding and misapplication of standards elaborating the noise requirements of the MD, by both manufacturers and their consultants, have been observed during work carried out following the NOMAD Phase 1 survey [15].

NOMAD Task Force achievements to date against Action 1

122. The NOMAD TF has produced a guide for manufacturers and other dutyholders.
123. The NOMAD Guide for Manufacturers [19]:
- a) Provides a Glossary of noise terms to help dutyholders to use correct noise terminology.
- b) Summarises the MD requirements for noise in the instruction manual and sales literature and, for outdoor machinery, how they interact with the OND.
- c) Advises how to use in-house expertise or consultants to provide noise data in accordance with the appropriate Type-C harmonised standard (or, where no Type-C harmonised standard exists, suitable Type-B standards) useful for risk assessment under the PAND.

- d) Advises and indicates useful standards that help construct the noise element of the machine's technical file and show how to present noise data in the instruction manual. It also covers when supplementary information is required and how to present it.
 - e) Provides examples of good instruction manual entries for noise emission declarations and gives advice on how to avoid common failings.
124. Invited consultation from manufacturers and their associations on the NOMAD Guide raised little comment. The limited feedback received was constructive, but reinforced the NOMAD TF perception that there are a wide range of interpretations of the actions required of manufacturers to satisfy the noise requirements of the MD.
125. The NOMAD Guide for Manufacturers has been published in 6 languages and can be accessed at:
- a) In German, English, Spanish, French, Dutch and Swedish at <https://www.baua.de/EN/Service/Publications/Report/NOMAD-Guide.htm> (accessed December 2019)
 - b) In Swedish and English at <https://www.av.se/halsa-och-sakerhet/buller/ansvar-for-buller/> (accessed December 2019)
 - c) In French at <http://travail-emploi.gouv.fr/ministere/documentation-et-publications-officielles/guides-pratiques/article/guide-destine-aux-fabricants-de-machines> (accessed December 2019)
 - d) In Spanish at <https://www.insst.es/documents/94886/214929/guia+fabricante+ruido/> (accessed December 2019)

Key Messages – Action 1

126. The key messages are:
- a) Noise information supplied according to the MD is interpreted and used differently by the various stakeholder groups.
 - b) The effectiveness of the MD requirement to report useful noise emission data is under challenge from some stakeholder groups.
 - c) The NOMAD Guide for Manufacturers helps dutyholders to provide noise information in instruction manuals and sales literature compliant with the MD requirements for noise.
 - d) The interaction between the noise requirements in three European Directives causes added complexity; the MD and the OND require the provision of noise information and the PAND requires employers to give particular attention to that noise information when carrying out a noise risk assessment.

ACTION 2 – RAISING AWARENESS OF MACHINERY BUYERS/USERS

NOMAD Phase 1 observations on the effective use of noise information supplied with machinery

127. The NOMAD Phase 1 survey report advocated information and promotion campaigns aimed at machine users (buyers) and Occupational Safety and Health (OSH) practitioners, to raise their awareness of the regulations concerning noise and the resources available to support them as dutyholders. Their main duty is likely to be managing the occupational noise risk associated with using noisy machinery.

128. The NOMAD Phase 1 survey report advocates a “selling and buying quiet” strategy, which promotes the benefits to businesses of buying quiet machines.

Difficulties in using supplied noise data

129. The NOMAD TF has seen that poor compliance of some machinery manufacturers with the legal requirements for noise can have a detrimental effect on the usefulness of all noise data.
130. Buyers (and manufacturers) confuse the quantities and purposes of the various noise metrics, including: *emission sound pressure level*; *peak sound pressure level*; *sound power level*; *guaranteed sound power level*; and *measured sound power level*.
131. For the *guaranteed sound power level* and *measured sound power level* required by the OND, the method for determining uncertainty is not defined and buyers are not entitled to all the information that would enable them to reliably compare the noise information supplied for similar machines by different manufacturers.
132. Inspection of the European Commission’s database of noise emissions for outdoor equipment [20] (Figure D1) shows that, for the families of machinery subject to an OND limit value, the *guaranteed sound power* is often at or just below the limit value. This can disguise considerable differences between machines, indicated by the respective *measured sound power levels*. Figure D1 shows a *guaranteed sound power level* has been reported that is above the *permissible sound power level* (the *guaranteed sound power level* should not exceed the *permissible sound power level*). It also shows that while there is only a 1 dB difference between the machines according to the *guaranteed sound power levels*, the *measured sound power levels* indicate a 4 dB difference.

	Certificate Date	Certificate Number	Equipment Model Name	Equipment Permissible Sound Power L	Guaranteed Sound Level	Measured Sound Power Level
Macdonald Air Tools Ltd Peel Park Place College Milton South East Kilbride, G 75 5 LS UK	11/13/06	16788	Euro 19T (GT19-A)	107	108	106
Macdonald Air Tools Ltd Peel Park Place College Milton South East Kilbride, G75 5 LS UK	6/15/07	16891	22TVR	107	107	104
Macdonald Air Tools Ltd Peel Park Place College Milton South East Kilbride, G 75 5 LS UK	6/15/07	16663	24 VRS	108	108	102
Macdonald Air Tools Ltd Peel Park Place College Milton South East Kilbride, G 75 5 LS UK	6/15/07	16789	GT24-V	108	108	102

Figure D1: Extract from the OND database for hand-held concrete breakers and picks (only internal combustion engine, between 15 and 30 kg) (https://ec.europa.eu/growth/tools-databases/noise-emissions-outdoor-equipment_en)

133. The variability in the reliability of noise data in sales literature and supplied with machinery, makes it difficult for buyers to make use of noise information required by law.

134. Buyers do not have immediate access to reliable and current information showing genuine choice between noisier and quieter models of similar types of machine.
135. Buyers using the principles of Buy Quiet have been successful in reducing noise risk through demands for suitable noise information when tendering to buy high noise, high value machinery, such as web-fed printing presses [21].
136. Recent observations suggest that lower noise choices can be made between moderate noise, moderate value machinery using manufacturers' noise information [16], but buyers have low confidence that lower noise alternatives are available and low confidence in manufacturers' or other noise information for making reliable comparisons.
137. Differences in declared noise emissions for powered hand-tools, suggesting low noise options, can be misleading. For example, differences observed in normal use can be negligible if the noise radiated from the workpiece dominates and is not adequately accounted for in the noise test [15]. Research on chain-saws shows that satisfactory noise tests do exist [16], [22].
138. In the case of machine tools, for example in woodworking [15], interpretation of the test specification can produce results that are not replicated in a normal workplace.
139. The limitations of using noise data supplied by machinery manufacturers may be poorly understood by buyers. Manufacturers must make clear the potential for noise risk under the noisiest typical use of a machine. Buyers wanting to make more specific use of the noise information supplied by the manufacturer must evaluate the relationship between their specific uses of the machine with the operating conditions used by the manufacturer to produce the noise data in the instructions.
140. Buyers must find the tools with a performance matched to the intended use before considering noise. For example, differences in the order of 20 dB may be observed in noise emission data supplied with tools. However, after taking account of performance characteristics, the difference in noise for similarly performing tools can be small or insignificant during normal use. There can be large differences in the noise declared for battery, mains electric and combustion engine tools. If low noise tools are suitable for the application, buying quiet can reduce noise by 20 dB [16].
141. The *emission sound pressure levels* provided with approximately 70% of a sample of 66 chain-saws made clear the high potential for noise risk: around 100 dB(A) for combustion engine chain-saws. The *sound power* level information supplied with chain-saws was considered unusable. The method to be used for electric chain-saws is not clear and it was not clear in the instructions which noise test code manufacturers had used [23]. The *sound power levels* for most of a small sample of chain-saws were verified by measurements made according to EN ISO 22868 [24] not ISO 9207 [25], which is required by the OND [22].
142. To Buy Quiet in today's market, buyers purchasing noisy machinery need a high level of understanding of noise and noise control and must have a high degree of determination to achieve noise control in their workplace. Buyers who successfully Buy Quiet seek out quieter machines and critically review the noise information supplied with them, which is often flawed. Such buyers sometimes need to write, and check conformity with, their own specification for noise. The NOMAD TF concluded that there is insufficient help available for buyers who want to Buy Quiet.

NOMAD Task Force achievements to date against Action 2

143. The NOMAD TF has produced the NOMAD Guide for Buyers - "*Buy Quiet*" Advice for buyers of machinery. It is a short leaflet to help buyers purchase or hire lower noise machinery. It outlines the advantages of buying quiet, the noise information that machinery manufacturers

should provide before purchase and explains how Buy Quiet and Sell Quiet approach and policies support a successful noise control strategy.

144. The NOMAD Guide for Buyers [26] has been published and can be accessed at:
- a) In German at <http://www.baua.de/DE/Angebote/Publikationen/Fakten/Leise-Maschinen.html> (accessed December 2019)
 - b) In Swedish and English at <https://www.av.se/halsa-och-sakerhet/buller/ansvar-for-buller/> (accessed December 2019)
 - c) In French at <https://travail-emploi.gouv.fr/demarches-ressources-doc/documentation-et-publications-officielles/guides/article/guide-acheteurs-de-machines> (accessed December 2019)
 - d) In Spanish at <https://www.insst.es/documents/94886/599872/guia+del+usuario+para+la+compra+de+una+m%C3%A1quina+m%C3%A1s+silenciosa.pdf/> (accessed December 2019)
 - e) In Dutch at <https://www.inspectieszw.nl/>
145. The NOMAD TF contributed to the drafting of an Institute of Noise Control Engineering Technical Study Group paper on Buy Quiet, which provides details of efforts worldwide to implement the Buy Quiet concept [27].
146. Circulation of the NOMAD Guide for Buyers to all stakeholders is ongoing, more particularly to the Occupational Safety and Health communities in Member States represented in the NOMAD TF.

Key Messages – Action 2

147. The key messages are:
- a) Noise emission values supplied with machinery in accordance with the MD vary in their reliability for establishing and comparing the noise risk of similar machines.
 - b) Extensive non-compliance of machinery suppliers with the noise requirements of the MD makes it difficult for buyers and employers to comply with the PAND. Furthermore, it limits the successful implementation of a Buy Quiet strategy.
 - c) Buyers with concerns over the reliability of noise emission data they wish to use in their Buy Quiet strategy, should raise their concerns about the relevant harmonised noise test standard with their national standards body.
 - d) Buyers must, in 2019, apply considerable effort themselves to check that the noise emission data supplied in sales literature and instruction manuals are accurate and reliable for comparison of the noise of similar machines.
 - e) Quieter machines, either by design or through barrier controls, have been secured through buyers' application of Buy Quiet for purchase of high noise, high value machinery.

ACTION 3 – GUIDANCE FOR MANUFACTURERS ON DRAFTING INSTRUCTIONS FOR NOISE FOR SPECIFIC MACHINERY FAMILIES

NOMAD Phase 1 observations on the value of guidance for specific families of machines

148. The NOMAD Phase 1 survey concluded that manufacturers lack the technical knowledge necessary to draft the noise content of machine instructions in such a way that they fulfil their legal duties and make the information they give useful to the user of the machine. The

NOMAD Phase 1 report recommended guidance documents, each specific to a machinery family, called “*How to draft the noise contents of instruction manuals*”, which were intended to help manufacturers write adequate instructions on noise. They would, in particular, provide clear lists of harmonised standards that are applicable to the machinery family.

Factors influencing the case for machine specific guidance

149. The Guide to the application of the MD was first published in 2010 during the original NOMAD survey; a revised Guide Edition 2.2 was published in October 2019 [10].
150. Given the difficulties and resources required to complete guides for the many specific families of machine, the NOMAD TF agreed to write a broad guide on noise for all manufacturers as discussed at Action 1.
151. Repeating the NOMAD Phase 1 survey in the future, after allowing sufficient time for manufacturers to follow this broad guide, that is the NOMAD Guide for Manufacturers [19], may provide evidence justifying the production of machine-specific guides.
152. A revision of the noise requirements of the MD, such that they are clearer and less reliant on understanding and interpretation through supplementary guidance, might reduce a future need for guidance targeted at specific families of machines.

NOMAD Task Force achievements to date against Action 3

153. The NOMAD TF noted that the Guide to the application of the MD and the NOMAD Guide for Manufacturers were both published since the NOMAD Phase 1 survey. The NOMAD TF agreed that Action 3 should not be addressed until there is evidence that further guidance is needed to help improve the quality of manufacturers’ declared noise emission data.

Key Messages – Action 3

154. The key messages are:
 - a) The publication of the Guide to the application of the MD and the NOMAD Guide for Manufacturers have reduced the need for machine-specific guidance on drafting the noise content of instructions.
 - b) The need for this machine-specific guidance should be reviewed in due course.

ACTION 4 – DATABASE FOR NOISE TEST CODES

NOMAD Phase 1 observations on a database for noise test codes

155. The NOMAD Phase 1 report proposed an action to consider establishing a European internet-based database to give machinery manufacturers easy access to relevant noise test codes (at least the reference numbers). The database would include a time history for each standard, with information on significant changes and details of the specific machines covered by the standard.

Factors influencing the case for a database for noise test codes

156. The NOMAD TF is aware of over 700 harmonised safety standards that include noise clauses. Standards for over 300 machine types consider noise to be a significant hazard.

157. A list of standards harmonised under the MD is published in the Official Journal of the European Union (OJEU) by the European Commission (Figure D2); this can be found at:

https://ec.europa.eu/growth/single-market/european-standards/harmonised-standards/machinery_en (accessed January 2020)

The screenshot shows the European Commission website interface. At the top, there is a navigation bar with 'Commission and its priorities' and 'Policies, information and services'. Below this is the European Commission logo and a search bar. The main navigation path is: European Commission > Internal Market, Industry, Entrepreneurship and SMEs > The European single market > European standards > Harmonised Standards > Machinery (MD). The page title is 'Machinery (MD)'. A table provides details for Directive 2006/42/EC, including its short name, base, and modifications.

Directive 2006/42/EC	
Short name:	Machinery (MD)
Base:	Directive 2006/42/EC of the European Parliament and of the Council of 17 May 2006 on machinery, and amending Directive 95/16/EC (recast) OJ No L 157, 9 June 2006
Modification:	Regulation (EC) N° 596/2009 - adaptation to the regulatory procedure with scrutiny [OJ L 188, 18 July 2009] Directive 2009/127/EC amending Directive 2006/42/EC with regard to machinery for pesticide application [OJ L 310, 25 November 2009] Regulation (EU) N° 167/2013 on the approval and market surveillance of agricultural and forestry vehicles [OJ L 60, 2 March 2013]

Figure D2: Title page of the European Commission maintained table of standards that have been published in the OJEU as harmonised standards

158. The references of harmonised standards published under the MD are found in the Commission Communication published in OJ C 092 9 March 2018 (Figure D3). Since 1 December 2018, details of harmonised standards published in and withdrawn from the OJEU are given in Commission Implementing Decisions (Figure D4). The Communication and the Commission Implementing Decisions must be read together, taking into account that later decisions may modify the references published in the Communication. A summary list (provided both as a pdf and an Excel spreadsheet) gives a consolidated overview of all the harmonised standards published in the OJEU (Figure D5).

Commission communication in the framework of the implementation of the Directive 2006/42/EC of the European Parliament and of the Council on machinery, and amending Directive 95/16/EC
(Publication of titles and references of harmonised standards under Union harmonisation legislation)
(Text with EEA relevance)
(2018/C 092/01)

ESO ⁽¹⁾	Reference and title of the standard (and reference document)	First publication OJ	Reference of superseded standard	Date of cessation of presumption of conformity of superseded standard Note 1
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A-type standards
A-type standards specify basic concepts, terminology and design principles applicable to all categories of machinery. Application of such standards alone, although providing an essential framework for the correct application of the Machinery Directive, is not sufficient to ensure conformity with the relevant essential health and safety requirements of the Directive and therefore does not give a full presumption of conformity.

(1)	(2)	(3)	(4)	(5)
CEN	EN ISO 12100:2010 Safety of machinery — General principles for design — Risk assessment and risk reduction <small>(ISO 12100:2010)</small>	8.4.2011	EN ISO 12100-1:2003 EN ISO 12100-2:2003 EN ISO 14121-1:2007 <small>Note 2.1</small>	30.11.2013

Figure D3: Sample of Commission Communication published in OJ C 092 of 9 March 2018

7.11.2019 EN Official Journal of the European Union L 286/29

No	Reference of standard	Date of withdrawal	Type
29.	EN 61029-2-4:2011 Safety of transportable motor-operated electric tools — Part 2-4: Particular requirements for bench grinders (IEC 61029-2-4:1993 Modified + A1:2001 Modified)	24 June 2020	C
30.	EN 62841-3-6:2014 Electric motor-operated hand-held tools, transportable tools and lawn and garden machinery — Safety — Part 3-6: Particular requirements for transportable diamond drills with liquid system (IEC 62841-3-6:2014, modified)	19 October 2019	C
31.	EN 62841-3-9:2015 Electric motor-operated hand-held tools, transportable tools and lawn and garden machinery — Safety — Part 3-9: Particular requirements for transportable mitre saws (IEC 62841-3-9:2014 Modified)	15 November 2019	C
32.	EN 62841-3-10:2015 Electric motor-operated hand-held tools, transportable tools and lawn and	19 October 2019	C

Figure D4: Sample of Commission Implementing Decision of 6 November 2019

Legislation reference (A)	ESO (B)	Reference number of the standard (C)	Title of the standard (D)	Type (E)	Date of start of presumption of conformity (1)	OJ reference for publication in OJ (2)	Restriction (3)	Date of start of presumption of conformity with restriction (4)	OJ reference for publication of a restriction in OJ (5)	Date of withdrawal from OJ (end of presumption of conformity) (6)	OJ reference for withdrawal from OJ (7)
2006/42/EC	CEN	EN ISO 9902-3:2001, EN ISO 9902-3:2001/A1:2009	Textile machinery - Noise test code - Part 3: Nonwoven machinery (ISO 9902-3:2001)	C	29/12/2009	OJ C 309 - 18/12/2009	-	-	-	13/02/2015	OJ C 054 - 13/02/2015
2006/42/EC	CEN	EN ISO 9902-3:2001, EN ISO 9902-3:2001/A1:2009, EN ISO 9902-3:2001/A2:2014	Textile machinery - Noise test code - Part 3: Nonwoven machinery (ISO 9902-3:2001)	C	13/02/2015	OJ C 054 - 13/02/2015	-	-	-	-	-
2006/42/EC	CEN	EN ISO 9902-4:2001, EN ISO 9902-4:2001/A1:2009	Textile machinery - Noise test code - Part 4: Yarn processing, cordage and rope manufacturing machinery (ISO 9902-4:2001)	C	29/12/2009	OJ C 309 - 18/12/2009	-	-	-	13/02/2015	OJ C 054 - 13/02/2015
2006/42/EC	CEN	EN ISO 9902-4:2001, EN ISO 9902-4:2001/A1:2009, EN ISO 9902-4:2001/A2:2014	Textile machinery - Noise test code - Part 4: Yarn processing, cordage and rope manufacturing machinery (ISO 9902-4:2001)	C	13/02/2015	OJ C 054 - 13/02/2015	-	-	-	-	-
2006/42/EC	CEN	EN ISO 9902-5:2001, EN ISO 9902-5:2001/A1:2009	Textile machinery - Noise test code - Part 5: Weaving and knitting preparatory machinery (ISO 9902-5:2001)	C	29/12/2009	OJ C 309 - 18/12/2009	-	-	-	13/02/2015	OJ C 054 - 13/02/2015

Figure D5: Sample of summary list (pdf format) of all harmonised standards showing search facility (version updated 4 December 2019)

159. The OJEU provides the following details: the reference number and title of the standard, the start date of the presumption of conformity, and details of superseded standards and date of cessation of the superseded standard where relevant.
160. The online OJEU is electronically searchable, which can be useful for finding standards for specific machines. But the NOMAD TF has observed that successful use of this search facility is highly dependent on knowing the exact name used for a machine type in the title of the standard. For example, a manufacturer of a machine marketed as a waste compactor, for use in the waste recycling industry, could not find the noise test code for this machine until they were informed that the title of the relevant harmonised standard described these machines as horizontal balers. A table of synonyms for machine types would be helpful.
161. The OJEU list identifies superseded editions of standards. Addressing inconsistencies in the dates of national editions of European standards would require national databases.
162. The NOMAD TF assessed the noise content of chain-saw instructions as part of the European-wide Joint Action on chain-saws (JAMach14) [23]. Although the appropriate standards were easily identified, the inter-relationship between the different chain-saw standards was complicated. Determining noise emission data for chain-saw involves using the current noise test code EN ISO 22868 [24], which requires use of a test rig and a simulated load, and the obsolete noise test code it replaced ISO 9207 [25], which requires a human operator to cut wood. Further, for electric and battery operated chain-saws, the *emission sound pressure level* is calculated from the *sound power level* which is determined using the current noise test code, while the *guaranteed sound power level* is derived from measurements according to the obsolete standard specified in the OND. For chain-saws, the inter-relationship between the MD and the OND requires manufacturers to follow two entirely different and equally complex test methods.
163. Obtaining obsolete noise test codes specified in the OND for outdoor machinery can be difficult and they may have been replaced by entirely different noise test methods.

NOMAD Task Force achievements to date against Action 4

164. The NOMAD TF agreed that Action 4 is addressed, at least in part, by the European Commission's publication of harmonised standards in the OJEU. The NOMAD TF would like to see the Commission maintain this indefinitely.

165. The OJEU is referenced in the NOMAD Guide for Manufacturers to help manufacturers to find the harmonised standards that cover their products.

Key Messages – Action 4

166. The key messages are:

- a) Noise test codes and safety standards including a noise test code, which are harmonised under the MD, are listed in the OJEU maintained by the European Commission. But it is widely recognised that finding the required standard in the OJEU can be difficult.
- b) Identification of the appropriate noise test code for a machine is highly reliant on knowing the name for the machine or machine family that is used in the title of the Type-C safety standards.
- c) It is possible, with persistence and some guidance, to identify the required standards from the OJEU together with CEN, ISO and national standards catalogues and use of commercial and free databases, such as Perinorm (<https://www.perinorm.com> - accessed November 2019) and NoRA (<https://nora.kan-praxis.de/> - accessed November 2019).
- d) Maintenance of a noise database as suggested by NOMAD Phase 1 is resource intensive. Duplication of effort to repeat the OJEU list should be avoided.
- e) One suggestion of the NOMAD TF is that it would be advantageous to transform the OJEU list into a database that provides a search facility, so that standards can be searched for terms including noise and/or the EHSRs listed in Annex Z.

ACTION 5 – IMPROVEMENTS RELATED TO HARMONISED STANDARDS

NOMAD Phase 1 observations on the improvement of harmonised standards elaborating the noise requirements of the Machinery Directive

167. The NOMAD Phase 1 survey highlighted two main problems:

- a) Poor reporting of noise information appeared to be associated with the complex structure of some standards; for example, hand-held or transportable electric tools; and
- b) Incomplete references to standards did not satisfy the MD requirement that '*the operating conditions of the machinery during measurement and the measuring methods used must be described*'; for example, the part number is required when the standards have many parts specific to sub-families of machines.

168. The problems associated with standards not being fully referenced (date and/or part number) were worse when the operating conditions and measurement methods had changed between successive versions of the standard(s).

Factors affecting the need for improvements to harmonised standards and noise test codes

169. The rules for drafting a noise test code [13] require tests at the machine's noisiest typical operating condition, which should provide emission data both useful for a risk assessment and that assists identifying machinery with reduced noise emission within the bounds of the quantified uncertainty.

170. Increasing repeatability and reproducibility of standard noise tests, such that the resultant noise data are not useful to a risk assessment, raises a separate requirement to warn of

potential for noise risk according to EHSRs 1.1.2 and 1.7.2; these data may not provide reliable comparisons of machines on the basis of noise.

171. Harmonised noise test codes that do not take appropriate account of workpiece noise may not provide values useful to a risk assessment and may not provide for reliable comparisons of noise. A standard noise test without a workpiece is acceptable if the emission value determined is representative of noisiest typical use.
172. Some harmonised standards require the provision of additional information and/or warnings to enable an assessment and the management of the associated risks, when the noise emission values obtained during the appropriate tests do not adequately represent the emissions during the intended uses of the machine; for example the current safety standard for pneumatic sanders [28].
173. Noise test codes that combine the noise for several modes of operation, each with a clearly distinguishable noise risk, and report it as a single combined value may mask the true potential for noise risk for some operations. Some standards, for example EN ISO 22868 for chain-saws, require the noise information for individual operations to be available on request, but users may not know this.
174. Test-houses and Notified Bodies using the poorly defined noise test codes specified in the OND to determine the *sound power level* of designated outdoor machines must make decisions on how to carry out the test. These decisions can result in unintended differences in the measurement methods or operating conditions during the noise tests, with consequent systematic differences that are a result of the test-house and not the machine under test.
175. For some designated outdoor machines, the OND specifies operating conditions for determination of *sound power level* that are different to those in standards harmonised under the MD for determining *emission sound pressure level*. There are some machines where the *sound power level* must be determined twice; according to the OND and following a different method according to the standard harmonised under the MD, from which an *emission sound pressure level* is estimated.
176. Some of the Type-B and Type-C standards specifying noise measurement methods referenced in the OND are obsolete and can be difficult to obtain. The current versions of the Type-B standards may require increased numbers of microphone positions and can achieve closer comparison of emission values, in particular for machines that emit highly directional sound.
177. Some harmonised standards do, and others should, address the wider requirements for instructions on noise; for example the provision of information on installation (EHSR 1.7.4.2 (j)), residual risk when the value determined according to a harmonised, or other, noise test code requires supplementary information to make clear the potential for noise risk (EHSR 1.7.4.2 (l)) and use of hearing protection (EHSR 1.7.4.2 (m)).

NOMAD Task Force achievements to date against Action 5

178. Difficulties faced by manufacturers implementing noise test codes elaborating the MD and the OND have been identified.
179. Difficulties faced by buyers and machine-users using the noise information in instructions that has been determined in accordance with the MD and OND, have been identified.
180. Strengths and weaknesses have been observed in the various and diverse approaches adopted by the writers of noise test codes. The noise test codes that have successfully defined operating conditions, which are reproducible and representative of the noisiest operation in typical use of the machine under test in accordance with EN ISO 12001, should be highlighted as they provide good examples to potentially improve future standards.

Key Messages – Action 5

181. The key messages are:

- a) Standards harmonised under the MD for determining noise emission data should address the noise information expectations of the PAND and accommodate the approach of the OND for the *sound power level* of designated outdoor machines.
- b) The requirement to choose operating conditions that give the highest noise emission during typical use is accepted but it can be difficult, for many reasons, to achieve in practice.
- c) Some of the dated safety standards and noise test codes referenced in the OND are obsolete and therefore difficult to find, but compliance with the law is only achieved by following these standards.
- d) Effort is needed to draft noise test codes, which provide noise emission data that:
 - Reliably identifies machinery with reduced noise emission; and
 - Provides useful information for the noise risk assessment required by the PAND.
- e) The *emission sound pressure level* can provide a guide to noise risk and enable a comparison of similar machines on the basis of noise.
- f) The *sound power level* can help comparison of similar machines on the basis of noise and can be used to predict noise exposure in the work room.
- g) The MD's requirement to determine, for designated outdoor machines, the *guaranteed sound power level* according to the OND involves the use, in some cases, of ambiguous test codes that may produce *sound power levels* that are not necessarily comparable.

ACTION 6 – TARGETED MARKET SURVEILLANCE CAMPAIGNS

NOMAD Phase 1 observations on the value of targeted market surveillance campaigns

182. The NOMAD Phase 1 survey identified widespread non-compliance of machinery manufacturers with the noise requirements of the MD.

183. The NOMAD Phase 1 survey report advocated targeted market surveillance campaigns to check the provision of noise information in any sales literature describing performance characteristics (brochures and catalogues presenting performance data of the machine, manufacturers' web sites). The report further suggested that such campaigns could be carried out in parallel with noise emission measurement campaigns aimed at verifying declared values of noise emission and establishing indicative values of noise emission for the machine families considered.

Difficulties for market surveillance authorities

184. Market surveillance exercises across Europe require significant resources, are time-consuming and can be technically challenging. A high degree of technical expertise may be needed to analyse machinery information and assess its compliance against the requirements of the MD.

185. MSAs must plan their campaigns, making provision for appropriate resources and expertise. A campaign might include checks on the provision of noise information in instructions and sales literature. An assessment of the quality of noise information will require access to acoustics expertise.

186. MSA campaigns on the noise requirements of the MD could address many points. The ultimate noise requirement of the MD is that the machine can be used safely regarding noise through application of the hierarchy of eliminating noise risk; that is through a) design and construction, b) use of protective measures, and c) provision of information about any remaining noise risk. Checks simply on the availability of required data can have a positive influence on compliance.
187. Many of the aims of the MSAs for a noise campaign might be achieved through consideration of noise information and noise data. Acoustics expertise is likely to be required, to judge the suitability of the noise information provided for assessing the level of noise emission by reference to comparative emission data for similar machinery or for using in a risk assessment under the PAND. This experience can be codified for use in future campaigns using less acoustics expertise.
188. MSA campaigns including consideration of the reliability of the noise data will require acoustics expertise and some testing, to check the extent to which the standards applied have produced noise data that are representative of the noisiest operation in typical usage of the machine.
189. Later campaigns might address improved performance compared with the findings of earlier campaigns and require relatively little deep expertise in noise.
190. Accessing superseded editions of standards and inconsistencies in the dates of national editions of European standards required to conduct market surveillance can cause difficulties for MSAs.

NOMAD Task Force achievements to date against Action 6

191. The NOMAD TF supported the noise component of a Joint Action on Machinery (JAMach14 - chain-saws). The participating MSAs forwarded the instructions supplied with 66 models of chain-saw to the NOMAD TF for assessment against the noise requirements of the MD. Although none of the instructions fully met the legal requirements for noise, the *emission sound pressure levels* provided with approximately 70% of the chain-saws made clear the potential for noise risk. The noise information provided with 30% of the chain-saws did not meet the MD requirements for noise. For 80% of the chain-saws, it was unclear how the *sound power levels* had been determined because of the inconsistent requirements of the MD and OND [23].
192. As part of the market surveillance exercise, the NOMAD TF assessed the noise emission information available on manufacturers' and suppliers' websites. Noise emission data consistent with that in the instructions was available on websites for less than 40% of the chain-saws. It is noted that the data supplied with the machines sampled may be older than the data on the website. The most common failings observed in the chain-saw market surveillance exercise were: the absence of any noise emission data; incomplete noise information provided; and inconsistencies between the noise data on the website and in the instructions.
193. Additional testing of the chain-saws sampled was carried out by some MSAs. The credibility of the declared noise emission data against the noise test codes referenced was established [22]. The credibility of the declared *emission sound pressure level* to represent the real use noise hazard was established [16].
194. The NOMAD TF produced a proforma for JAMach14 to enable the systematic collection of noise information, which could be used for future market surveillance exercises on noise. However, it is clear that MSAs would require acoustics expertise when analysing the noise information especially if further testing is necessary to assess the performance of referenced harmonised noise test codes.

195. The NOMAD TF established that small but significant differences in the terminology and expectations of the MD, the OND and the PAND required successful market surveillance to be conducted by personnel with a sufficiently high level of competence in acoustics.

Key Messages – Action 6

196. The key messages are:

- a) Market surveillance exercises are needed to secure improved compliance with the noise requirements of the MD, such that machines are being designed and constructed with low noise risk or, where this is not possible, they are supplied with information enabling the purchaser to compare the noise of machines with comparable performance characteristics and assess and manage the residual noise risk.
- b) Successful market surveillance exercises for noise require significant resources and the support of technical experts familiar with acoustics, the PAND's expectations of noise data supplied with machinery, and the requirements of the MD and harmonised standards elaborating the MD and the OND.
- c) MSAs, with appropriate technical support, can check the provision of noise information supplied with noisy machinery.

ACTION 7 – TRAINING MARKET SURVEILLANCE PERSONNEL

NOMAD Phase 1 observations on the need for training market surveillance personnel

197. The NOMAD Phase 1 survey highlighted a lack of sufficient knowledge, among those carrying out market surveillance (for example labour inspectors), in basic acoustic terminology and on the detail of the EHSRs on noise specified in the MD. Specific training appears to be necessary to carry out efficient market surveillance in this area. In this context, a market surveillance checklist providing a short description of the noise-related requirements, together with examples of sufficient, good and bad noise declarations would be very useful. It must be made clear that numerical values in decibels, used in many European Directives, can represent different physical quantities related to noise (for example, noise emissions of equipment, noise levels at a location, or personal noise exposure levels), which cannot be compared numerically.

Difficulties in the training of market surveillance personnel

198. Based on the support provided to the Joint Action on chain-saws (JAMach14), the NOMAD TF concluded that it will be difficult for MSA inspectors inexperienced in noise to do any more than establish gross failures by machinery manufacturers, for example, the failure to provide any noise information. The noise requirements in the MD and the OND were found to be poorly aligned for chain-saws and as such, assessing the traceability and credibility of noise information provided requires expertise in acoustics.

199. Manufacturers have expressed concern that absence of market surveillance is disadvantaging compliant manufacturers.

NOMAD Task Force achievements to date against Action 7

200. The NOMAD TF Guide for Manufacturers could be used by MSAs as it provides examples of satisfactory noise declarations and a glossary of noise terminology. It was used for the JAMach14 market surveillance exercise.

201. The NOMAD TF proforma used to systematically collect noise information could be used by MSAs to check the provision of noise data in machinery instructions and sales literature.

Key Messages – Action 7

202. The key messages are:

- a) Initial market surveillance exercises, making thorough investigations of compliance with noise requirements, will need extensive support from noise experts who understand the interaction between noise requirements in the MD and the OND and to verify the usefulness of noise emission data for the family of machinery.
- b) MSA interventions on noise, seeking to raise awareness of the requirement for manufacturers to report the noise hazard of their machinery, could be based on the NOMAD Guide for Manufacturers.

ACTION 8 – CLARIFICATION OF THE ROLE(S) OF NOTIFIED BODIES

NOMAD Phase 1 observations on the effect on compliance of involvement of Notified Bodies

203. The NOMAD Phase 1 survey results suggested that it was only slightly more likely that instructions for Annex IV machines were more compliant than those for non-Annex IV machines. However, instructions on noise should be significantly better for Annex IV machines given the greater likelihood that a Notified Body is involved in any conformity assessment process. It is important that the duties and required competencies of Notified Bodies regarding noise are clear.

Difficulties for Notified Bodies concerning noise

204. Discussions between NOMAD TF members and Notified Bodies for the MD indicate that some Notified Bodies:

- a) Consider noise testing to be too complicated and not always aligned to producing data that describes noise risk.
- b) Sometimes question the usefulness of the noise emission data produced in accordance with the OND.

205. The OND requires declaration of a *guaranteed sound power level*. But the lack of a well-defined approach for determining the measurement and production uncertainties makes it very difficult for Notified Bodies to assess manufacturers' declared emission values, in particular for those machinery subject to limit values.

NOMAD Task Force achievements to date against Action 8

206. The NOMAD Guide for Manufacturers includes information useful for Notified Bodies checking the conformity of the noise contents in instructions.

207. The Horizontal Coordination Group of the Notified Bodies in Europe produced a Recommendation for Use (RfU) sheet in 2017, in consultation with members of the NOMAD TF. It provides a checklist, consistent with guidance in the NOMAD Guide for Manufacturers, for producing machine instructions that ensure compliance with the noise requirements of the MD. The RfU is not published (at the end of 2019).

208. The NOMAD TF is encouraging Notified Bodies to finalise and implement their RfU.

Key Messages – Action 8

209. The key messages are:

- a) The RfU has been drafted since late 2017. It reflects the guidance provided in the NOMAD Guide for Manufacturers on reporting noise information in instructions. This draft has yet to be published (at the end of 2019).
- b) Some Notified Bodies have limited noise expertise, while others have none.
- c) Some Notified Bodies believe that the noise test codes for producing the required noise emission data (particularly for designated outdoor machinery) are not robust and that detailed checking of noise data is not [yet] worthwhile.

APPENDIX E: LETTER FROM EU DG GROW



EUROPEAN COMMISSION

Directorate-General for Internal Market, Industry, Entrepreneurship and SMEs

Industrial Transformation and Advanced Value Chains
Advanced Engineering and Manufacturing Systems

Brussels,
GROW/C3/MGC/

Mr Jean Jacques
NOMAD Task Force
noise-bruit1@outlook.fr
CC: NOMAD.Task.Force@hse.gov.uk

Subject: Invitation to participate in the AdCo Machinery NOMAD Workshop 2 in Madrid (Spain) on 20 June 2019

Dear Mr Jacques,

Many thanks for your kind invitation to participate in the AdCo Machinery NOMAD Workshop 2, planned in Madrid (Spain) on 20 June 2019.

We regret not being able to honour your invitation, due to inevitable overlaps of work arrangements for the Commission's officials in the field of machinery and outdoor noise emission. We would like to assure you that we follow with interest the activities of the NOMAD Task Force, and we will be grateful to receive feedback from the referred event.

We acknowledge the importance of the activities of the NOMAD Task Force established within the Administrative Co-operation Group under the Machinery Directive 2006/42/EC, very related also to the Outdoor Noise Emission Directive 2000/14/EC. In this sense, the NOMAD achievements since 2013 – in particular, the expertise provided, the agreements reached and the guidance documents produced so far – are very useful support to the sectorial stakeholders in fulfilling their legal obligations related to the reduction of noise emission at source, namely manufacturers, notified bodies, market surveillance authorities, etc. This is a work of significant importance also for the ongoing initiatives for a possible revision of Directives 2006/42/EC and 2000/14/EC, for which the contributions of the NOMAD Task Force will be taken into due account.

Yours sincerely,

Felicia Stoica (Deputy HoU)
Mikhail Simonov (Policy Officer 2006/42/EC)
Mario Gabrielli Cossellu (Policy Officer 2000/14/EC)

Commission européenne/Europese Commissie, 1049 Bruxelles/Brussel, BELGIQUE/BELGIË - Tel. +32 22991111
Office: BREY 10/160 - Tel. direct line +32 229-95941

GROW-DIR-NOISE@ec.europa.eu