NOISE FROM ASHPS – WHAT DO WE KNOW?

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1 ABSTRACT

The UK government needs to transition domestic heating away from fossil fuel systems to low carbon alternatives like air source heat pumps (ASHPs). However, there are concerns about noise emissions from residential ASHP units. This paper summarises recent research on ASHP noise in the UK context. Key topics include: characterising ASHP noise sources and measurement standards; evaluating noise limits in the Microgeneration Certification Scheme (MCS); surveying environmental health professionals on ASHP noise complaints; identifying barriers to ASHP adoption; and recommending changes to noise regulations and assessment procedures. Notable findings show the MCS method overestimates noise at nearby properties. This paper recommends clarifying sound power level measurement conditions, removing the arbitrary 'background' noise level from the MCS assessment, allowing ASHPs on front facades, and publishing good practice installation guides. Further research should address cumulative noise impacts, acoustic features like tonality, and field monitoring of installed ASHPs. Overall, quieter ASHP design is essential for widespread adoption while preserving residential amenity.

2 INTRODUCTION

The current UK Government has aspirations to ban the sale of new gas boilers from 2035, creating a greater reliance on the electricity grid for space and water heating in UK homes. Compared to direct electric heating, air source heat pumps reduce electrical grid resource requirements by extracting heat from air outside of a building using heat exchangers, refrigerants, and compressors to provide many times more heat than they consume in electrical load. However, this places new noise sources outdoors in a residential environment. In response to concern about noise from ASHPs, the UK Government and the devolved administration in Wales have commissioned reviews of the evidence surrounding noise from air source heat pumps. This paper presents some of the key findings of these reviews to date, makes recommendations for changes to the regulatory framework for the installation of air source heat pumps in homes in England and Wales, and identifies key areas of research in the area.

As of March 2022, 80% of dwellings with an EPC analysed in both England and Wales used mains gas to fuel the central heating[1] and the residential sector is responsible for 17.0% of all carbon dioxide emissions in the UK,[2] the majority of which is due to space and water heating. Under the UK Government's current plans, there is a gas and oil boiler ban in newbuild homes from 2025; there is currently no legislation in place to ban the installation of new gas boilers in existing homes. Schemes such as the Boiler Upgrade Scheme (BUS) provide a grant towards a renewable heating system, like a ground source or air source heat pump (ASHP), in existing dwellings. The aim of the scheme is to provide an incentive to upgrade to a renewable heating system. To access this grant, the homeowner must install the heating system under the Microgeneration Certification Scheme (MCS), which allows an ASHP to be installed outdoors under Permitted Development Rights (PDRs). PDRs are granted as a right with no requirement to apply to the relevant planning authority and derive from a general planning permission granted, not by the local authority, but by national governments.[3]

3 ASHP NOISE EMISSIONS

3.1 Noise Sources

An ASHP transfers heat from outside of a dwelling to a refrigerant gas by drawing the air over a heat exchanger using a fan. The temperature of the gas is further increased by compressing it using a compressor. The heated refrigerant is then passed through a second heat exchanger, which transfers the heat from the refrigerant to the water that is piped around the house. 'Monobloc' systems have all these components within the outdoor unit, with only water pipes connected to the house. 'Split' systems have the water heat exchanger and compressor inside the house, which means refrigerant pipes are connected to the dwelling; this requires additional installation expertise but does improve efficiency. An illustration of a Monobloc system has been given in Figure 1, highlighting the two primary noise sources of an ASHP, the fan and the compressor. Split systems can have quieter outdoor units because the compressor is located inside the dwelling.

An example monobloc heat pump, which extracts heat from the air by using two fans to draw air over a heat exchanger containing refrigerant. The refrigerant is further heated by passing it through a compressor. The heated refrigerant passes through a condenser, transmitting heat to water pumped from inside the dwelling. The two main noise sources inside an air-to-water heat pump are, therefore, fans and compressors.

One or more fans draw ambient air over the heat exchanger to extract heat from the air.

A compressor is used to raise the temperature of the refrigerant.

Figure 1: Principal noise sources in ASHP. Pictures Copyright © 2009-2022 LG Electronics.

A block diagram from a pan-European study of heat pumps, the Annex 51 project, has been reproduced in Figure 2 showing how the fan and compressor can be described as the main noise sources.[4] Further secondary sources, such as valves or heat exchangers, create noise as the refrigerant and air flows through them. Figure 2 also shows the transmission paths, both airborne and structure borne, and where noise control measures need to be used to interrupt these paths to prevent emission to the atmosphere.

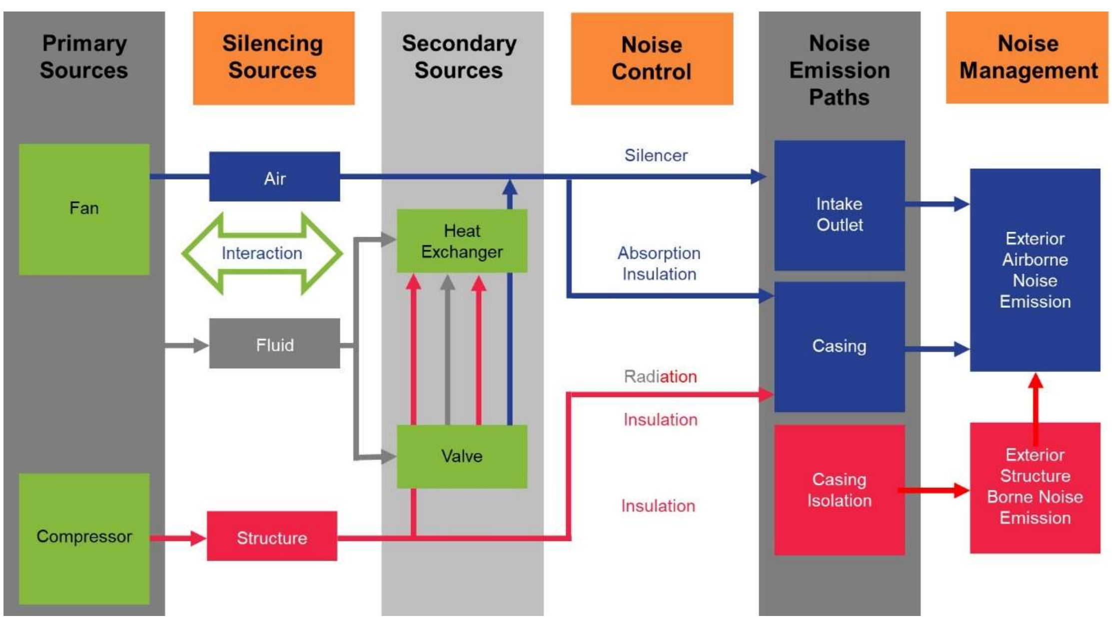

Figure 2: Noise emission paths and associated control mechanisms.

An acoustic engineer knows that the best way to reduce noise emissions is to treat the source; for ASHPs this means minimising the noise from the primary sources: the fan and the compressor. Figure 3 shows that a heat pump may be operated to optimise its thermal performance or its acoustic performance by controlling the fan and compressor speeds,[5] but there is a trade-off between these desirable operating points.

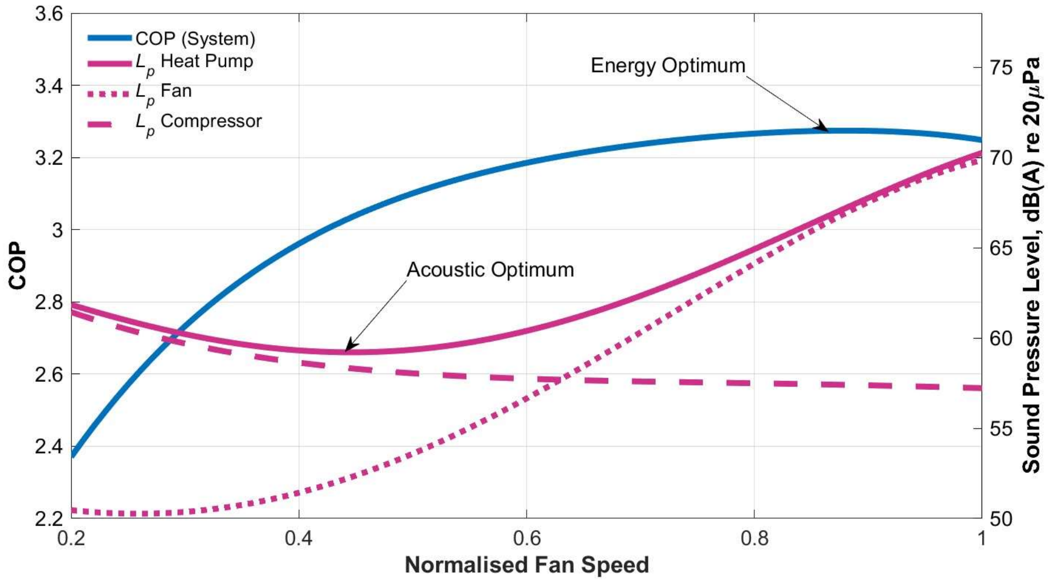

Figure 3: Contribution of the fan and compressor to the overall sound emissions.

The simulation illustrated in Figure 3 shows how the fan and compressor speeds are interdependent; thus, the noise emissions and energy efficiency are also interdependent. An increase in the fan speed results in increased mass air flow and more heat is transferred to the evaporator. This reduces the need to further increase the pressure of the refrigerant, and so the compressor's speed is reduced. The crucial point illustrated in Figure 3 is that the overall noise emissions can be significantly reduced by a comparatively small deviation from the energetic optimum, which in this example means a reduction in efficiency of just 1.22 provides a reduction in sound pressure level from 67.2 dB(A) to 62.2 dB(A). ASHP manufacturers can skew the design towards noise control with only a modest reduction in efficiency, if that is what the market desires.

3.2 Measurement and Evaluation

ASHPs are referred to as low, medium, and high temperature. Low temperature ASHPs are designed to run at a water temperature of up to 45°C, for systems such as heat pump convectors and underfloor heating, whereas the high-temperature heat pumps are designed for use with older radiators which require higher water temperatures, sometimes reaching up to 70°C. The Energy-related Products (ErP) regulation 813/2013 specifies the operating conditions at which the sound power level for an ASHP should be declared, this is reproduced in annex A.4 of BS EN 12102-1.[6] The standard conditions for ASHPs are 7(6)/30-35°C. That is: 7°C dry bulb temperature; 6°C wet bulb temperature; 30°C inlet water temperature; and 35°C outlet water temperature. Therefore, the ErP SWL is based on a 'low-temperature' condition regardless of whether it is a low-temperature ASHP. These are also the standard rating conditions given in Table 12 of BS EN 14511-2;[7] however, the sound power level is declared in association with a heating capacity and the only capacity measured for the regulation at the same outdoor air temperature is the part load point C condition from Table 8 of BS EN 14825, .i.e. 7(6)/*-30.[8]

Round robin tests performed for the Annex 51 project reported good agreement between the participating laboratories for these operating conditions.[9] However, for other operating conditions the results were more scattered, which is important for the application of the MCS planning standard in the UK because it states that the "highest sound power level specified should be used". Whilst the MCS planning standard is not specific about the range of operating conditions this should take account of, BS EN 14825 Table 8 provides four operating conditions (A-D), of which the Annex 51 round robin illustrated exercise showed condition C was approximately 10 dB lower than condition A. The relationship between the measurement standards has been illustrated in Figure 4.

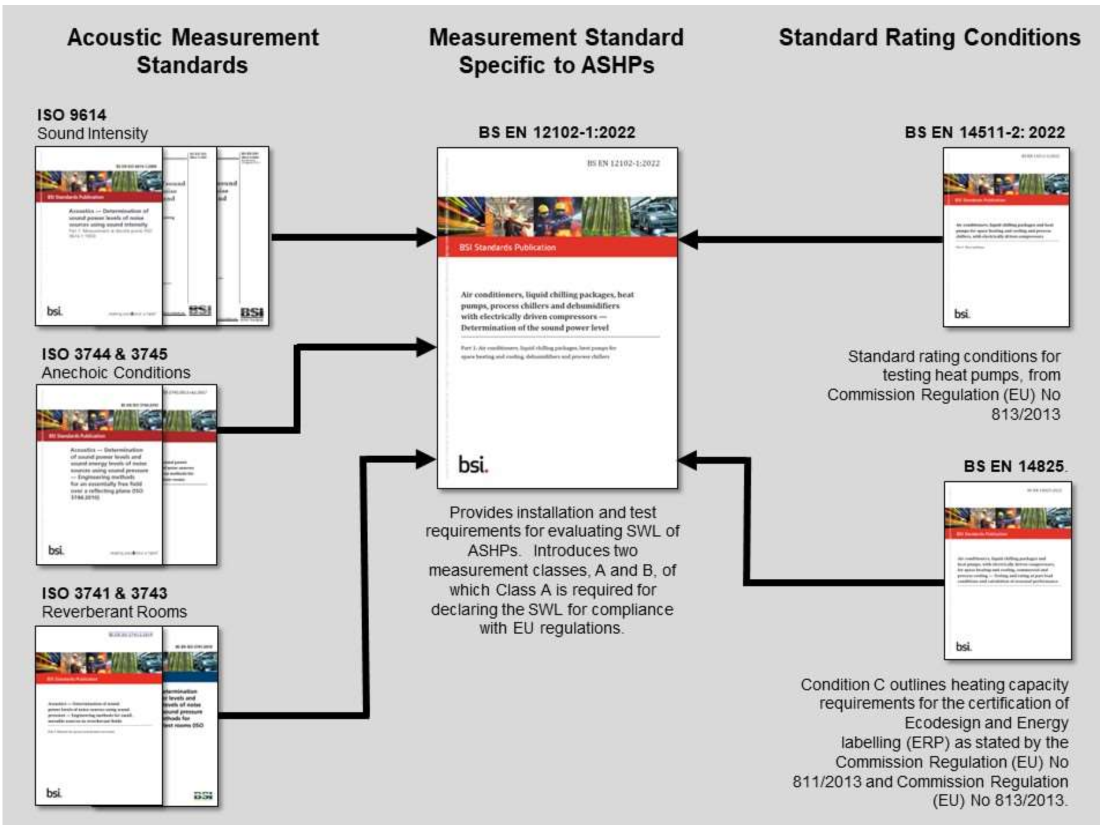

Figure 4: Standards related to the evaluation and declaration of ASHP SWL.

With reference to Figure 4, BS EN 12102-1: 2022 provides the specific test arrangements for the measurement of heat pumps, including ASHPs. It identifies seven acoustics standards for the evaluation of sound power level, which include measurements in reverberation and anechoic rooms, as well as sound intensity methods. The range of sound power levels of the top five manufacturers, based on number of installations in the NCS database, is shown in Figure 5. This demonstrates that there can be a range of 10 dB between the highest and lowest sound power levels for a required heating power, even within this small selection of manufacturers.

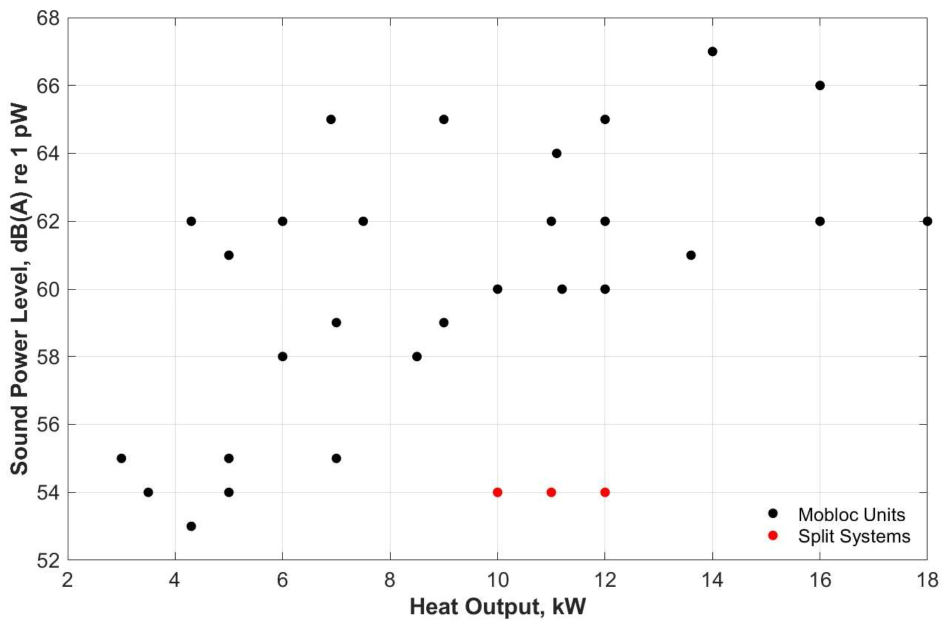

Figure 5: Heating power and sound power of the main manufacturers' monobloc units and one split system.

From an environmental noise practitioner's point of view, there is a common problem with the way that noise emissions are declared in product datasheets. Sound power level, measured according to one of the standards featured in Figure 4, should be the figure declared in a datasheet because it provides a measure of the total sound emitted by a test object, which makes it possible to calculate the resulting sound pressure level at a remote assessment location. Some manufacturers choose to declare noise emissions as a sound pressure level at 1m, presumably because it is a lower number that makes the unit appear to be quieter in the literature. A poll recently carried out on LinkedIn showed that this data is likely to be variably interpreted by environmental noise practitioners when evaluating noise from ASHPs.[10]

3.3 Measurements Beyond Standard Conditions

One of the findings from the Annex 51 project is that the operating point used for the ERP label produces far from the highest sound power level. In fact, during round robin testing across several laboratories in Europe, the difference between operating point C from BS EN 14825 and point A was greater than 10 dB.[11] This causes a problem because the MCS assessment requires the "highest sound power level" to be used,[12] which is likely to be higher than measurements made at the operating point used for the ErP label. However, manufacturers are reluctant to undertake any tests that are not mandatory, as these products already require a large array of tests.

Furthermore, all the operating points specified in the standards set out in Figure 4 refer to steady-state conditions when, according to surveys, many complaints about ASHP noise are related to transient noise related to startup, shutdown and defrosting, or tonal noise.[13,14] Annex 51 documents a variety of sounds, such as valves opening and closing, and pressure being released, that may attract additional attention, while the overall continuous equivalent sound level ($L_{Aeq,T}$) is much lower than during normal operation for the machines tested. There is currently no industry-standard characterisation of these types of transient sounds from ASHPs.

4 THE MCS ASSESSMENT

To be eligible for the BUS, a proposed ASHP installation must comply with the MCS Planning Standard,[12] which includes a noise assessment procedure. The MCS noise calculation appears, on first inspection, to limit noise impact to 42 dB(A), but within the calculation procedure it is necessary to add the calculated impact ("specific sound level" in BS 4142 parlance) to a notional background ("residual sound level" in BS 4142 parlance) of 40 dB(A). Within the calculation pro-forma given in MCS 020, the absolute level limit for the calculated impact is 37.0 dB(A).[12] The procedure consists of 10 steps, which reference two data tables and rely on the ASHP under assessment being measured to a known standard. An overview of the MCS noise assessment procedure has been summarised in Figure 6.

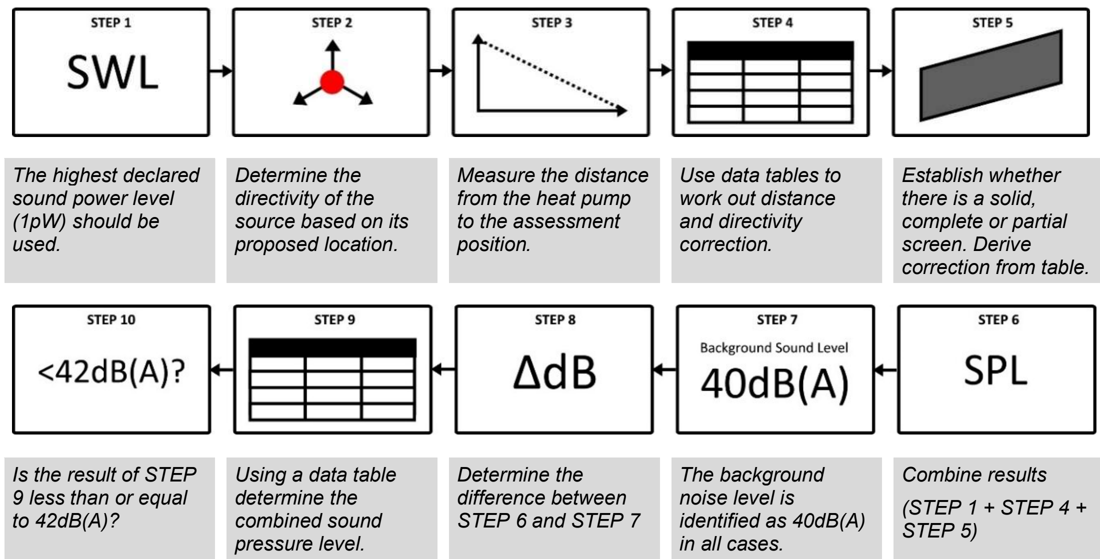

Figure 6: Overview of the 10 steps of the MCS noise assessment.

If the sound of the ASHP plus the background noise is less than or equal to 42dB(A) at the assessment position, the installation will comply with the permitted development noise limit. If not, the installation will not be a permitted development; but it may still go ahead if planning permission is granted by the local planning authority.

4.1 Opportunities to improve the MCS

The MCS noise assessment procedure requires the “highest sound power level” to be used. In interviews carried out for the Welsh Government, all but one of the manufacturers is indicating that this is the sound power level from the ErP energy label; however, as described in section 3, this is very unlikely to be the highest sound power level that their product will emit. This doesn’t necessarily indicate subterfuge, since there is no legal requirement to measure sound power level at any other operating point; nonetheless, it would be helpful for the MCS to clarify the operating conditions that the sound power level should be measured under in the interest of fairness. In the interest of positive outcomes, it would be useful if this operating condition reflected the likely worst case noise emissions.

The MCS noise limit is explicitly stated to be 42 dB $L_{Aeq,5\text{-}mins}$. At first glance, the use of a fixed background sound level of 40 dB(A) appears to consider the existing noise climate; however, on closer inspection, if the background noise level is fixed and always added to the level of the ASHP, what it actually does is make the noise limit 37.8 dB $L_{Aeq,5\text{-}mins}$ and simply introduce an unnecessary step into the calculation procedure. It is likely that the intended limit was 37 dB(A) because it is the next lowest whole number that can be added to the 40 dB(A) background noise level and still be less than or equal to the 42 dB $L_{Aeq,5\text{-}mins}$ limit.

The fixed background sound level has another unintended consequence, if added to the sound level of an ASHP in all cases, there is little incentive for manufacturers to produce significantly quieter ASHPs. If two competing installers proposed units, one that was 32 dB(A) at the assessment location and one that was 37 dB(A), the result of the MCS noise assessment would be 40.6 dB(A) and 41.7 dB(A) respectively, which masks the true magnitude of the difference between the two products. One manufacturer has highlighted this as a significant failing of the MCS noise assessment procedure, suppressing the competitive edge of manufacturers with quieter products.[14]

MCS contractors do not calculate attenuation due to geometrical spreading, they use data tables provided in the MCS planning standard, which give an attenuation in decibels for a range of distances between the ASHP and assessment location. However, the data tables provide a series of preset distances between one and 30 m in 14 steps, which means that the step sizes are up to 5 m. The MCS noise assessment procedure requires the contractor to select the correction in dB associated with next lowest step size, which results in a conservative assessment. Figure 7 illustrates what this means for the maximum sound power level of any ASHP.[i]

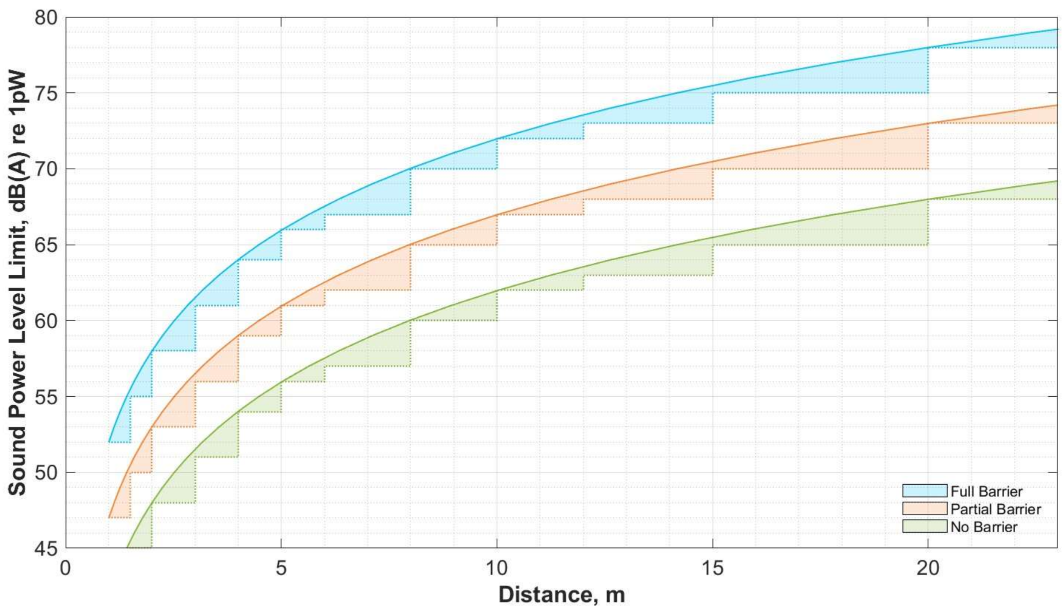

Figure 7: Comparison of the MCS noise assessment distance correction (dotted line) with calculated geometrical spreading correction (solid line) with the directivity, Q = 4.

Figure 7 illustrates the difference between the MCS calculation procedure's discrete distance correction and the continuous attenuation provided by geometrical spreading. The difference between the two is highlighted by the shaded area, which is significant and ranges between 0 and 3 dB that makes the assessment far more onerous as the distance reaches the upper edge of a step. This has been identified as a potential barrier to the adoption of ASHPs in the UK because the MCS noise assessment procedure is being overly conservative in some situations. The average difference between the stepped line and the curve is 2 dB, making the actual MCS noise limit closer to 35 dB(A), which is comparable with other European states.[15]

The restriction that this places on the installation of ASHPs is made plain when the required heat output for the different property types in England and Wales is considered. The breakdown of the various property types and the required ASHP heat output for each is illustrated in Table 1 and Table 2.[15]

House Type	Percentage of Overall Housing Stock
Mid-terrace	31.0
Semi-detached	28.9
Detached	20.9
Low-rise flats	16.4

Table 1: Comparison of the MCS noise assessment outcomes with the core principles.

House Type	Recommended ASHP Heat Output, kW
2-bed house/flat	5
Poorly-insulated 3-bed house	9
Well-insulated 4-bed house	9
Poorly-insulated 4-bed house	16
Well-insulated 5-bed house	15

Table 2: Comparison of the MCS noise assessment outcomes with the core principles.

Nearly 80% of residential properties in the UK are attached in some way to a neighbour and require an ASHP with at least a 5kW heat output. Figure 8 summarises what this means on the basis of the top five ASHP manufacturers by volume.[16] It plots the required separation from an ASHP to the assessment location of a neighbouring property using the MCS noise assessment procedure against the required heat pump output. The plot has been shaded with three regions:

- **RED**, above which there are no ASHP products that provide the required heat output at a low enough sound power level;
- **GREEN**, below which there is a product that satisfies the required heat output at a suitable sound power level; and
- the **AMBER** central region, where the only ASHPs that would meet the MCS noise limit at the required distance would be a split system.

As previously, these areas are defined with a directivity factor of Q = 4, i.e. the interface of two reflecting planes and direct line-of-sight has been assumed in this plot, i.e. the ASHP is mounted at the rear of typical house.

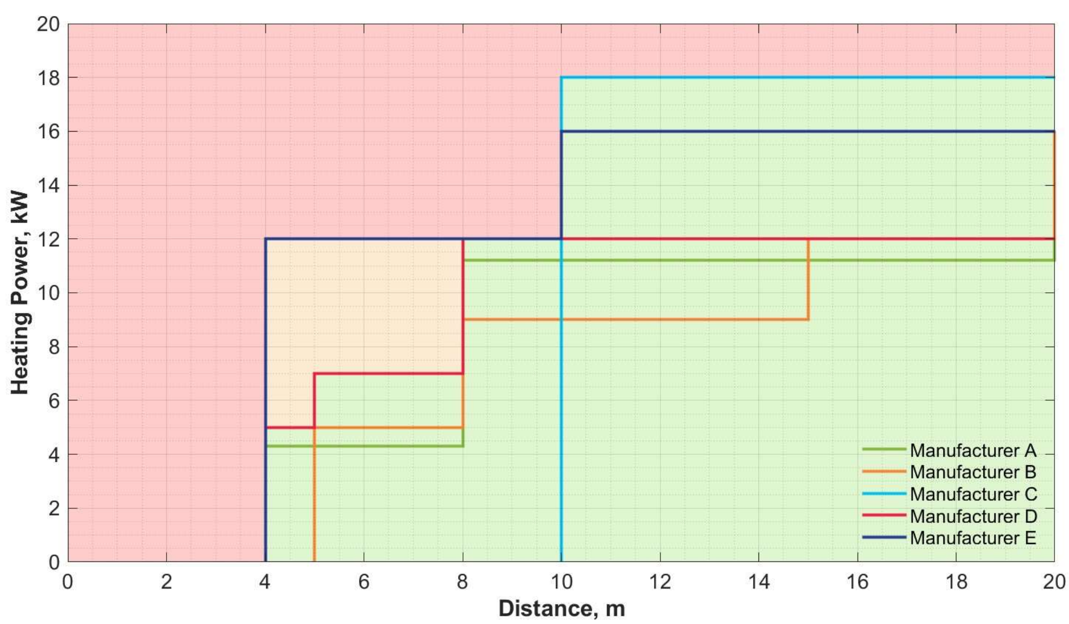

Figure 8: Comparison of the MCS noise assessment outcomes with the core principles.

A 4 m separation distance is shown to be the minimum that would allow an ASHP to be installed in this typical situation and this still relies on the building itself being well insulated. For a poorly insulated house that requires approximately 9 kW of heating, only a split system would be suitable. A split system requires more equipment to be located indoors, which in modest 3-bedroom semi-detached houses might be difficult to find, as well as more qualified installers to handle the refrigerant. This means that currently, ASHPs would be difficult to install under the MCS in a typical terrace or even semi-detached house. Without the MCS there is no BUS grant and, therefore, a likely significant reduction in uptake of ASHPs across the England and Wales.

5 SURVEYS OF NOISE CONTROL PRACTITIONERS

In 2022, the Institute of Acoustics' Noise and Vibration Engineering Group published a survey to collect information on noise from ASHPs,[13] which included the following named respondent categories: noise consultants; members of the Chartered Institute of Environmental Health (CIEH); and members of the public. The aim of the survey was to record the experiences of people who had complained about or dealt with the complaints about noise from ASHPs, which was otherwise entirely anecdotal.

Whilst still open, the survey has had 121 responses at the time of writing. 62% of respondents to the survey worked in local authorities, which should be taken as an indication of how effective the survey was communicated to the CIEH membership, and provides a healthy sample of English and Welsh local authority experience. 37 of these environmental health professionals had received complaints, statutory nuisance was established in 16 of these cases, but in only six of these cases was an abatement notice served. It should be noted that in only 11 of these 37 cases was it known that the ASHP had been installed under PDR using the MCS. Of the 10 responses from noise consultants, four said that tonal noise was the key acoustic feature driving the complaint and eight used a BS 4142 type assessment to evaluate the noise impact.

As part of the Welsh Government review, 20 of the 22 local authorities in the devolved region were interviewed.[14] In many instances, the interviewees reported that they hadn't received many complaints about noise from ASHPs but did expect a sharp increase if UK Government installation targets are met. This was supported by statistics provided by the MCS showing that, indeed, domestic ASHP installations are few and far between in Wales with the majority taking place in rural areas. This is very likely to be where ASHPs are replacing oil boilers where low population density originally made extension of the gas network unviable.

Planning offices tended to only concern themselves with visual aspects, not wanting to install ASHPs within 3 m of a property boundary and containing the size of ASHP (currently limited to 0.6m^3 for PDR). Environmental health departments had wider concerns, in particular the potential for background noise creep, with less concern for hard rules about where the ASHP was located and more emphasis on the noise at the receptor. There was also a strong feeling that acoustic features, such as tonality and intermittency, should be included in any assessment.

6 RECOMMENDED CHANGES TO PDR AND MCS

As described in section 4 there are a number of barriers affecting the widespread adoption of ASHPs through the BUS. The following are suggestions that might remove or minimise these barriers without resulting in increased noise impact.

6.1 Sound Power Level

The sound power level used in the MCS noise assessment procedure should not be open to interpretation. It should be clearly stated under what operating conditions the sound power level used in the assessment should be measured. In its simplest form this could be the declared sound power level from the ErP energy label, but it might be appropriate to specify another operating point from BS EN 14825.

6.2 Minimum Distance from Boundary

In Wales, ASHPs must be at least 3 m from the boundary with the neighbouring property, regardless of the outcome of the MCS noise assessment procedure; in England this figure is 1 m. There are situations where it would be appropriate to remove this requirement altogether; for example, where the ASHP is located next to a substantial barrier (such as a brick wall) that lies on the boundary with the neighbour. Attenuation would be maximised in this arrangement and placing the ASHP further away from the boundary would reduce the path difference and the resulting attenuation. On a purely noise basis, there are grounds for removing this minimum distance criterion from PDR.

6.3 MCS Background Noise Level Correction

The use of an arbitrary notional background noise level that is added to the sound pressure level of the ASHP at the assessment location is nonsensical. It is strongly recommended that this part of the MCS noise assessment procedure be removed and an absolute specific sound level limit be used. This allows the advantage of quieter units to be made plain and the noise assessment procedure to be easier to follow.

6.4 Acoustic Feature Corrections in MCS

There is evidence that tonality should be specifically accounted for when assessing the noise impact of ASHPs. If tonality were apportioned a penalty, this would avoid manufacturer's minimising the sound power level at the expense of increased tonality. This would, however, require a means of evaluating tonality in laboratory conditions, which is not currently available.

6.5 Tabulated Corrections for Distance in MCS

The use of data tables for corrections at discrete distances creates steps in attenuation that may result in the specific sound level of the ASHP at the assessment location to be overestimated. Changing these tabulated distance corrections for ones based directly on geometrical spreading, calculated using an online tool to allow lay-persons to complete the noise assessment procedure, would remove this problem. This could also be provided as a design chart, like Figure 7, allowing for easy identification of the attenuation for different directivity and barrier situations.

6.6 PDR Restrictions on ASHP Location

PDR currently prevents the installation of ASHPs on the front façade of a residential property. In noise terms this makes little sense because for most UK households the dominant noise source affecting their property is road traffic noise, most likely from the road it is fronting. If the visual impact can be mitigated, this could be a very effective way to minimise noise impact. Many ASHP manufacturers are investing in the aesthetic design of their products which could minimise other planning concerns.

6.7 Allowance for a Background Noise Survey

As described in section 4, the MCS noise limit is effectively 35 dB(A). This is a relatively low sound pressure level to be measured outdoors and could be unnecessarily restrictive in areas where background noise levels exceed 40 dB(A). It might be appropriate to allow for a background noise survey to be part of the MCS noise assessment procedure in situations where the levels are likely to be much higher than the noise limit. This would help households in noisier areas access grants via the BUS when noisier heat pumps wouldn't be expected to result in increased noise impact, such as near major transport infrastructure. A definitive description of what the background sound level is would need to be agreed for such a purpose.

6.8 Separate Daytime and Night-Time Noise Limits

It makes sense for an ASHP to work intensively during the daytime to heat the water for a household when outdoor ambient air temperatures are higher; background noise levels are also likely to be higher during the daytime. It is suggested that the existing noise limit could be preserved for the night-time (23:00 – 07:00) and a relaxation could be given during the daytime to increase the number of viable installations. This approach is adopted in Germany[17] and relies on the grid's energy surplus during the night-time to provide heating; practically how this is managed in a ASHP controller is unknown.

6.9 Democratising Data

Households that seek to install ASHPs under the BUS are currently reliant on the MCS installer to complete the noise assessment and identify suitable products. However, MCS installers are likely to offer only one manufacturer's range of ASHPs and a household might be told that their boiler upgrade isn't possible when another installer might have been able to offer a product that better suited their needs. This is the so-called 'noise-lottery'.

An online tool with a database of all the suitably approved ASHPs could be provided to allow consumers to use the distance from their preferred installation location to the assessment location to identify suitable ASHPs based on their required heat output. The MCS installer could then be selected based on the suitability of the products they offer, rather than the other way around.

6.10 Good Practice Examples

A series of examples demonstrating good practice could aid installers in locating ASHPs in optimal locations. These could introduce the idea of acoustic absorption as a means of controlling reflected sound and maximising the attenuation of barriers.

7 CONCLUSIONS

From the reviews, surveys and interviews that have been carried out over the past 18 months, there is clear objective evidence that the sound emissions from ASHPs have the potential to cause annoyance and give rise to complaints. The current low level of complaints is very likely to be due to installations occurring under the MCS in low-density areas but this could change as the BUS encourages adoption by households in more suburban and urban areas. The concerns of local authorities and members of the public are justified. This is, however, balanced by the efforts of ASHP manufacturers, who are designing ever more efficient and quieter products. The fact remains that ASHPs are essential for reducing the UK's energy demand as it shifts away from burning fossil fuels in its homes.

This paper has outlined how the sound from ASHPs is measured, evaluated and assessed in England and Wales. Barriers to the adoption of ASHPs have been identified, which include areas where treatment of noise is too relaxed, but also where treatment of noise is unnecessarily stringent. These include:

- clarifying the operating conditions under which the ASHP sound power level is measured for use in the MCS noise assessment;
- removing the contribution of an arbitrary background noise level from the MCS noise assessment procedure;
- the use of arbitrary limitations on the distance of ASHPs to neighbouring boundaries for PDR;
- allowing ASHPs to be installed at the front of properties under PDR, where the background noise level is likely to be higher;
- democratising ASHP noise data for the public to make informed choices;
- creating an online calculation tool for MCS installers, rather than relying on data tables;
- reconsidering the MCS noise limit to:
  - include separate night and day criteria;
  - account for acoustic features; and
- publishing good practice examples for MCS installers to follow.

8 FURTHER WORK

The work carried out in the UK in the past 18 months has highlighted a number of areas where further research is required to fill gaps in knowledge.

Noise creep or cumulative impact is an issue of concern highlighted mainly by the membership of the CIEH; however, there is very little published evidence on how increasing the number of external items of fixed mechanical plant in residential areas would affect the underlying background sound level or the perceived soundscape. Desktop exercises could address the question of background sound levels and auralisation and listening studies could be used to evaluate the potential changes to the soundscape.

Acoustic features, such as tonality and intermittency, come up repeatedly in surveys and interviews as causes for complaints. However, acoustic features do not form part of the MCS noise assessment procedure, which encourages manufacturers to design for low sound power levels rather than good sound quality. Further research is required to identify how sound quality can be evaluated in laboratories where ASHPs are measured, so that comparisons can be made between different ASHPs and appropriate corrections can be applied as part of the MCS noise assessment.

It has been recommended that examples be provided to MCS installers that illustrate best practice when choosing the location for the ASHP. However, more research is required to identify effective absorbent treatments that can be used to minimise canyoning and maximise the effect of noise barriers. This would also require better understanding of the directivity of the ASHP noise emissions, which is limited due to the reverberant conditions that most ASHP sound measurements are made in.

Recommendations have been made for establishing night-time and daytime limits for the MCS noise assessment, but work would need to be undertaken to identify what an appropriate limit would be. This is made all the more important if corrections for the presence of acoustic features are to be included in the assessment procedure.

Whilst the transient characteristics of ASHPs has been studied as part of the Annex 51 project, this has been for a limited number of units in a limited number of situations. There would be real benefit in monitoring a number of ASHPs installed under the MCS over a 12-24 month period to evaluate the noise emissions in a variety of meteorological conditions typical of the UK. Measurement equipment that is connected to the internet would allow this to be done at relatively low-cost.

Finally, there is important work for all acousticians to do. ASHPs do not need to be ‘noisy’; the manufacturer’s published data shows that ASHP sound power levels have significantly reduced in the last 20 years and this trend is likely to continue through the hard work and ingenuity of mechanical, electrical, design and acoustic engineers around the world. ASHPs are essential for energy efficiency in our homes and they are here to stay. We as an industry need to encourage good practice, celebrate good design engineering and embrace the low level ‘purr’ of low carbon heating systems. The sound of ASHPs is part of the future, let’s make sure we don’t confuse the positive low-level sound of an essential appliance with an annoying source of noise. This is a message that needs to be relayed to the public by all of us.

9 ACKNOWLEDGEMENTS

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