Health and Safety Executive

Hand-arm vibration of horticultural machinery

Part 2

Prepared by the **Health and Safety Laboratory** for the Health and Safety Executive 2011

RR894
Research Report

Health and Safety Executive

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Part 2

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In recent years there have been many cases of HAVS being reported for people who work in agriculture, horticulture and landscape gardening. HSE/HSL does not currently hold much information on vibration exposures in these areas of work.

The work described in this report assesses the standard test for hedge trimmers defined in BS EN ISO 10517:2009 for repeatability and ease of use and where possible for reproducibility (by comparing machine manufacturers' declared vibration against HSL measurements to the same standardised procedures). It also assesses the validity of the measurement techniques adopted in the vibration emission test, investigates some of the factors which are likely to influence the results of the test and compares the vibration emission values with vibration magnitudes measured under real operating conditions.

The report concludes that for three of the four hedge trimmers the vibration emissions slightly overestimate the upper quartile. For the fourth hedge trimmer the upper quartile is overestimated by approximately 50%. Placing of the vibration emissions during normal intended use of the machinery in satisfactory rank order cannot be assured by comparing the vibration emissions determined according to the test code, BS EN ISO 10517:2009. The test code inconsistently represents workplace vibration.

This report and the work it describes were funded by the Health and Safety Executive (HSE). Its contents, including any opinions and/or conclusions expressed, are those of the authors alone and do not necessarily reflect HSE policy.

HSE Books

First published 2011

KEY MESSAGES

The vibration emissions of hedge trimmers and their use for long periods during a working day can result in exposures above the Exposure Action Value (EAV) of the Control of Vibration at Work Regulations 2005 and for some models of these machine types, without adequate control of exposure duration, above the Exposure Limit Value (ELV) of the Regulations.

The vibration emissions of models of these machines varies sufficiently for it to be possible to reduce the vibration hazard by careful consideration of vibration when selecting a hedge trimmer.

Placing of the vibration emissions during normal intended use of the machinery in satisfactory rank order cannot be assured by comparing the vibration emissions determined according to the test code for hedge trimmers, BS EN ISO 10517:2009.

EXECUTIVE SUMMARY

Objectives

In recent years there have been many cases of HAVS (Hand Arm Vibration Syndrome) reported for people who work in agriculture, horticulture and landscape gardening. HSE/HSL does not currently hold much information on vibration exposures in these areas of work. Data from the HSL HAVS referrals database show that of the 329 people who have been diagnosed with HAVS, approximately 10% of them list hedge trimmers as one type of equipment which they had been using on a regular basis.

The Supply of Machinery (Safety) Regulations 2008 require that, amongst other information, suppliers of machinery must declare the vibration emission of their tools and machines. The purpose of declaring such information is to allow purchasers and users of tools and machinery to make informed choices regarding the safety of a potential purchase and to facilitate use of the tools without risk – in this case, risk of vibration injury.

The method of declaring vibration emission is to apply a standard test to a machine or tool. The purpose of the standard test is to provide a repeatable and reproducible method of producing a vibration emission value and its uncertainty for declaration purposes. However, in practice, designing a standard test often involves compromise between realistic operation and providing the repeatability and reproducibility sought by manufacturers. The standard test for hedge trimmers is based on artificial operations.

The objectives of the work were to provide HSE with information regarding:

1. The likelihood that use of a hedge trimmer’s declared vibration emission value according to BS EN ISO 10517:2009, for comparison of the vibration of hedge trimmers, will assist avoiding purchase of high vibration machines.

2. The likelihood that use of a hedge trimmer’s declared vibration emission value according to BS EN ISO 10517:2009 will facilitate a reliable estimate of workplace exposure for comparison with the Exposure Action Value (EAV) of the Control of Vibration at Work Regulations 2005 (Vibration Directive 2002/44/EC).

3. Limitations of the test code and scope for improvement that can be fed back into the responsible standardisation group.

Main Findings

Objective 1

Vibration emissions of hedge trimmers are sufficient to present an occupational risk of vibration injury.

Choosing between models of hedge trimmer on the basis of declared vibration emissions can help minimise the vibration risk.

Using the standard tests outlined in BS EN ISO 10517:2009 (and an earlier standard test, BS EN 774:1996, used by the manufacturer for two of the machines), manufacturers’ declared emission values were verified according to the criteria in BS EN 12096:1997 in three out of the four cases.

Objective 2

When comparing manufacturers' data with the upper quartile field magnitudes for the highest measured value at the BS EN ISO 10517:2009 locations, only one of the manufacturers' ***a*** emission values approaches the upper quartile of in-use data. However, when the ***a+K*** value is used, the upper quartile is exceeded or adequately represented for all four machines. This shows that the use of existing manufacturers' ***a*** emission data for the purposes of risk assessment will result in an underestimate of the vibration risk associated with the use of the machine. However, the ***a+K*** value gives a reasonable estimate of the vibration risk in three out of four cases. In the case of Machine A, use of ***a+K*** results in a 50% overestimate, but the magnitude of vibration is small relative to the other machines. HSL data suggests that a smaller value of ***K*** could be declared for Machine A.

When comparing HSL measured emission values with the upper quartile field magnitude at the BS EN ISO 10517:2009 measurement locations, the upper quartile is slightly overestimated for three of the four hedge trimmers. For the fourth hedge trimmer the upper quartile is overestimated by approximately 50%, even before taking the ***K*** value into consideration. The vibration risk associated with the use of the machines is overestimated by up to 50%.

Objective 3

There are significant differences between the vibration emissions of the hedge trimmers tested both according to the standard test and in normal workplace use. All machines could present risk of vibration injury if their use is not adequately managed and two of the hedge trimmers would require more careful management on account of their higher vibration emission.

ANOVA (Analysis of variance) of the vibration magnitudes measured for individual operators during the emission tests showed that the emissions are significantly different for each operator for three of the four hedge trimmers. This suggests that the emission test procedure in BS EN ISO 10517:2009 could be improved by deriving the emission value from tests made using more than one operator.

BS EN ISO 10517:2009 produces emission values which identify that Machines A and D are the better machines, consistent with the upper quartile vibration determined during normal use. The upper quartile value determined for Machine B suggests that this is the highest vibration machine. However, BS EN ISO 10517:2009 suggests that the vibration of Machines B and C is similar, contrary to findings from comparison of the upper quartile vibration. The test code inconsistently represents workplace vibration

Recommendations

The reason for the test code's inconsistent representation of workplace vibration should be investigated.

BS EN ISO 10517:2009 should be revised to require three operators to carry out the emission test. The use of only one operator is not valid as a main source of variation of the vibration magnitude is from the operator.

The C_v criterion should also be reduced from the current specification of 'Less than 0.4'. Setting a criterion of 'Less than 0.15', as widely used in pneumatic and electrical standards seems sufficient.

Measuring while the hedge trimmer is *idling* does not appear necessary and should be removed, as it only makes the emission test more complicated.

HSE should advise users to take the manufacturers' ***a+K*** values as indicators of likely in-use vibration values for hedge trimming.

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1 INTRODUCTION

1.1 BACKGROUND

Hand-arm vibration emission test code standards support the legal requirement of the Machinery Directive (Supply of Machinery (Safety) Regulations)) to report vibration emission. For vibration these standards have a central role in the legal framework for inspection of suppliers of work equipment and they provide a presumption of conformity with the requirement to declare vibration emissions.

Work by HSE/HSL to evaluate vibration emission standards for hand-held power tools and machines has shown that many test codes provide vibration values that substantially under-represent vibration risk. Employers estimating the vibration exposure of their employees using the information provided by the manufacturer may be unwittingly putting their employees at high risk of developing hand-arm vibration syndrome (HAVS).

The work reported here is carried out under a project that encompasses machines which are powered by internal combustion engines. There are a number of internal combustion type machines which are known to represent a risk to health, for example lawnmowers and hedge trimmers, for which HSL had not previously carried out an assessment of the emission standards. HSE requires more knowledge on the typical vibration magnitudes and exposures from machines such as hedge trimmers and this needs to be addressed, particularly in view of the fact that incidence of HAVS is increasingly prevalent among those who work in grounds maintenance and similar occupations that use these machines.

The relevant standards are:

- BS EN ISO 10517:2009 *Powered hand-held hedge trimmers – Safety*, the vibration emission test code evaluated in this report.

- BS EN 774:1996 *Garden equipment – Hand held, integrally powered hedge trimmers – Safety*, the predecessor to BS EN ISO 10517:2009.

- BS EN ISO 20643:2008 *Mechanical vibration – Hand-held and hand-guided machinery – Principles for evaluation of vibration emission*, provides the basis for drafting vibration test codes and requires declared emissions are representative of the 75th percentile of emissions during normal use.

- BS EN 12096:1997 *Mechanical vibration – Declaration and verification of vibration emission values*, used for the verification of manufacturers' declared emission values.

1.2 OUTLINE OF WORK

In recent years there have been many cases of HAVS being reported for people who work in agriculture, horticulture and landscape gardening. HSE/HSL does not currently hold much information on vibration exposures in these areas of work.

The machines most commonly used are pedestrian controlled lawnmowers, brush and grass cutters, chainsaws and hedge trimmers. Previous research has been carried out for the Forestry Commission looking at chain saws and brush cutters (NV/04/04 and NV/01/16 respectively), however pedestrian controlled mowers and hedge trimmers have not been investigated. Data from the HSL HAVS referrals database show that of the 329 people who have been diagnosed with HAVS, approximately 10% of them list hedge trimmers as one type of equipment which they had been using on a regular basis.

The Supply of Machinery (Safety) Regulations 2008 require that, amongst other information, suppliers of machinery must declare the vibration emission of their tools and machines. The purpose of declaring such information is to allow purchasers and users of tools and machinery to make informed choices regarding the safety of a potential purchase and to facilitate use of the tools without risk – in this case, risk of vibration injury.

The method of declaring vibration emission is to apply a standard test to a machine or tool. The purpose of the standard test is to provide a repeatable and reproducible method of producing a vibration emission value and its uncertainty for declaration purposes. However, in practice, it has been difficult to design a standard test that is both based on a realistic operation and provides the repeatability and reproducibility sought by manufacturers. The standard test for hedge trimmers is based on artificial operations.

At the time of testing, the current version of the standard test code for measurement of vibration emission of hedge trimmers was BS EN ISO 10517:2009. The work for hedge trimmers had three aims:

1. To assess the standard test defined in BS EN ISO 10517:2009 for repeatability and ease of use and where possible for reproducibility (by comparing machine manufacturers' declared vibration against HSL measurements to the same standardised procedures).

2. To assess the validity of the measurement techniques adopted in the vibration emission test and investigate some of the factors which are likely to influence the results of the test.

3. To compare the vibration emission values with vibration magnitudes measured under real operating conditions.

The objectives of the work were to provide HSE with information regarding:

1. The likelihood that use of a hedge trimmer's declared vibration emission value according to BS EN ISO 10517:2009, for comparison of the vibration of hedge trimmers, will assist avoiding purchase of high vibration machines.

2. The likelihood that use of a hedge trimmer's declared vibration emission value according to BS EN ISO 10517:2009 will facilitate a reliable estimate of workplace exposure for comparison with the Exposure Action Value (EAV) of the Control of Vibration at Work Regulations 2005 (Vibration Directive 2002/44/EC).

3. Limitations of the test code and scope for improvement that can be fed back into the responsible standardisation group.

2 MACHINES TESTED

Four hedge trimmers were acquired for testing as shown in Figures 1a-d.

Figure 1a Machine A

Figure 1b Machine B

Figure 1c Machine C

Figure 1d Machine D

Table 1a describes the basic characteristics of the four hedge trimmers and Table 1b details their declared vibration emissions.

Table 1a Basic characteristics

Machine	HSL Sample No.	Cutting length (mm)	Weight (kg)	Engine speed idle/max (rpm)	Engine speed at max. power[1] (rpm)
A	NV/10/07	600	5.6	2800/9100	7000
B	NV/10/06	600	5.7	2700/8400	8400
C	NV/10/05	690	6.0	3500/	6700
D	NV/10/04	735	6.3	2700/10500	9000

[1] Engine speed at maximum power is used when undertaking the emission test

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Table 1b Declared vibration emissions

Machine	Declared vibration emission (m/s^2)						Test code quoted	Calculated vibration emission (m/s^2)	
	Idling $a_{hv,Id}$		*Racing* $a_{hv,Ra}$		*Equivalent* $a_{hv,Eq}$			*Equivalent* $a_{hv,Eq}$	
	a	***K***	***a***	***K***	***a***	***K***		***a***	***K***
A	-	-	-	-	2.3	2.0	ISO 20643	-	-
B	2.3	-	4.5	-	-	-	EN 774	4.2	2.1*
C	-	-	4.6	0.5	-	-	EN 774	-	-
D	2.3	-	3.1	-	-	-	EN ISO 22867	3.0	1.5*
*K value calculated according to provisions in BS EN 12096:1997									

In Table 1b, the 'Test code quoted' column is how the test codes are quoted in the machine handbooks. None of the handbooks included a date of the test code.

Idling (subscript: Id) is the engine speed at which the cutting equipment does not move.

Racing (subscript: Ra) is the engine speed at 133% of the speed at maximum engine power

Equivalent (subscript: Eq) is based on a work cycle composed of idling and racing and is given by

$$a_{hv,Eq} = \left(\frac{1}{5}\bar{a}_{hv,Id}^{\,2} + \frac{4}{5}\bar{a}_{hv,Ra}^{\,2} \right)^{1/2} \qquad \text{Equation 1}$$

$a_{hv,Eq}$ is the *equivalent* vibration emission value

$\bar{a}_{hv,Id}$ is the mean *idling* vibration emission value

$\bar{a}_{hv,Ra}$ is the mean *racing* vibration emission value

For Machines B and D where the manufacturers' have declared both *idling* and *racing* values, HSL has calculated an *equivalent* value based on Equation 1.

Machine A has a declared vibration emission *equivalent* value based on ISO 20643. Since this is a general declaration standard it is assumed that the actual test code followed is BS EN ISO 10517:2009 because the manufacturer has declared an *equivalent* vibration magnitude, a term that only appears in this machine specific standard.

Machines B and C have declared vibration emissions according to EN 774. The manufacturer of Machine B has declared both *idling* and *racing* values and so an *equivalent* value has been calculated by HSL. The manufacturer of Machine C has declared only a *racing* value as required in BS EN 774:1996.

Machine D has declared vibration emissions based on EN ISO 22867:2008. This particular emission standard is intended for forestry machinery and so does not apply to hedge trimmers. However, the test code procedure for strimmers in BS EN ISO 22867:2008 is almost identical to BS EN ISO 10517:2009. The manufacturer has declared both *idling* and *racing* values and so an *equivalent* value has been calculated by HSL.

3 LABORATORY TESTING OF VIBRATION EMISSION

3.1 EMISSION TEST PROCEDURE FOR POWERED HAND-HELD HEDGE TRIMMERS

The emission test procedure for a hedge trimmer is a free running test, which involves no actual cutting. Measurements are carried out with the machine *idling* and the machine *racing* and an *equivalent* vibration value is determined using Equation 1. *Idling* is the engine speed at which the cutting equipment does not move. *Racing* is the engine speed at 133% of the speed at maximum engine power. All of the machines tested in this report have a speed limiter set below this 133% speed and so are tested at full throttle.

Tests are carried out on a new, normal production hedge trimmer fitted with standard equipment. The hedge trimmer is run in and warmed up until stable conditions are reached before the test is started. The cutting device is lubricated and the fuel tanks are full. The hedge trimmer is operated with the operator standing upright and held with the axis of the cutting device orientated as in the normal rest position on a horizontal surface as shown in Figure 2.

Figure 2 Operator position

The test procedure requires a minimum of four measurements and at least four separate periods of vibration data totalling at least 20 seconds. Between each measurement there must be a break, when the machine is allowed to reach a stable idling condition. The vibration test codes for many other machine categories, use five measurements per operator. Consequently, in these tests, HSL have chosen to measure five cycles of *idling* and *racing* with a 20s measurement time for each.

BS EN 774:1996, the predecessor to BS EN ISO 10517:2009, calls for 5 *racing* measurements only.

Both test codes specify one operator only. A description of the criteria for the use of one operator is given in BS EN ISO 20643:2008 which states that…

…if it can be shown that the vibration is not affected by operator characteristics, it is acceptable to perform measurements with one operator only.

3.2 TRANSDUCER MOUNTING LOCATIONS

The transducer locations specified by BS EN ISO 10517:2009 are shown in Figure 3. The dimensions are in millimetres.

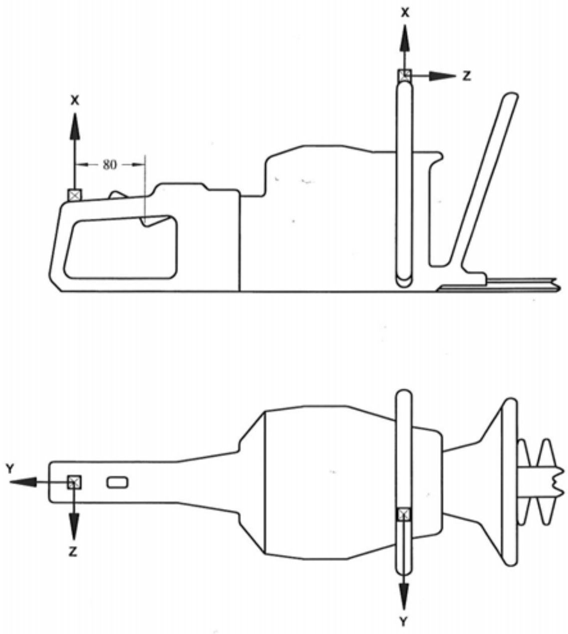


Figure 3 Position of transducers (taken from BS EN 10517:2009)

3.3 DATA ACQUISITION AND ANALYSIS

Details of instrumentation used for acquisition and analysis of vibration emission data is given in Appendix A.

The transducers used for all of the measurements were PCB Type 356A02 ICP triaxial accelerometers. The accelerometers were bolted to a custom-made aluminium mounting block and fixed in place using a plastic cable tie and tensioning gun. The cable tie system (shown in Figure 4) produces a reliable, repeatable fix that has been tested at HSL, and has been shown to be rigid within and well beyond the frequency range of interest for hand-arm vibration measurements. For Machine C, the rear hand accelerometer was fixed in place using cyano-acrylate glue rather than a cable tie, as to not interfere with the use of the trigger.

Figure 4 Aluminium block positioned using the cable tie system

Each of the five separate measurements of *idling* and of *racing*, for one operator only, was a twenty second linear analysis, made using a Brüel & Kjær (B&K) Pulse multi-channel real time frequency analyser. One-third octave band analyses of the data were carried out. The data were also frequency weighted in accordance with BS EN ISO 8041:2005 and then stored on the PC. The overall frequency weighted vibration magnitude at each measurement position was recorded after each test.

After five measurements each of *idling* and *racing*, the coefficient of variation C_v, was calculated. The C_v is equal to the standard deviation divided by the mean of the five measurements. BS EN ISO 10517:2009 states that the measurements are valid if C_v is less than 0.4. If C_v was greater than or equal to 0.4 then testing continued until five consecutive measurements gave an acceptable value of C_v.

For each hedge trimmer, the declared vibration emission figure for *idling*, is the mean value of the five measurements for *idling* and the declared vibration emission figure for *racing*, is the mean value of the five measurements for *racing*. The *equivalent* vibration value is then calculated using Equation 1.

The individual deviation ***K***, is calculated according to the provisions of BS EN 12096:1997 Annex B.2, where a single machine is used to declare the vibration emission.

3.4 EMISSION TEST RESULTS

The full results of the emission tests, including frequency spectra, are given in Appendix B.

Table 2 contains the results of the HSL emission tests according to BS EN 774:1996 which requires a racing value and BS EN ISO 10517:2009 which requires an equivalent value. The figures in **bold** indicate the mounting location with the highest vibration emission.

Table 2 Vibration emission total values measured at HSL

Machine	Frequency weighted vibration magnitude (m/s^2)							
	Racing BS EN 774:1996				*Equivalent* BS EN ISO 10517:2009			
	Front hand		Rear hand		Front hand		Rear hand	
	a	***K***	***a***	***K***	***a***	***K***	***a***	***K***
A	1.9	0.4	**3.1**	**0.5**	2.0	0.4	**3.0**	**0.4**
B	5.2	1.2	**6.8**	**1.7**	5.2	1.0	**6.6**	**1.3**
C	**7.7**	**1.3**	4.8	0.6	**7.1**	**1.2**	4.5	0.5
D	**4.4**	**0.9**	3.7	0.4	**4.2**	**0.7**	3.5	0.4

The emission tests were carried out using three operators, to see if the use of only one operator as permitted in the standard is justified.

A C_v of less than 0.4 was achieved easily. Only one value of C_v was greater than 0.15, which occurred during *idling* measurements when there is greater variation in the engine speed.

4 ADDITIONAL LABORATORY MEASUREMENTS

4.1 ADDITIONAL OPERATORS

BS EN ISO 10517:2009 specifies that a single operator can be used for the test. To investigate the assumption that only one operator is necessary, all of the emission tests were carried out using three operators. The results are shown in Table 3, based on *equivalent* vibration values.

Table 3 Operator *equivalent* values from emission tests. The figures in brackets are the percentage differences from operator 1.

	Equivalent vibration magnitudes (m/s^2)		
	Op 1	Op 2	Op 3
Machine A	3.2	3.1 (-3%)	2.7 (-16%)
Machine B	6.4	7.5 (+17%)	5.9 (-8%)
Machine C	6.5	6.9 (+6%)	7.8 (+20%)
Machine D	4.0	4.0 (0%)	4.6 (+15%)

Table 3 shows absolute differences of up to 1.3 m/s^2 from Operator 1 and percentage differences of between –16% and +20% between operators for the same machine.

4.2 HORIZONTAL VS VERTICAL OPERATION

Hedge trimmers are operated using one of two cutting techniques. For the horizontal cut technique (Figure 5a) the cutter bar is held at an angle of 0° to 10° as the hedge trimmer is swung horizontally. For the vertical cut technique (Figure 5b) the cutting bar is swung in an arc from the bottom upwards.

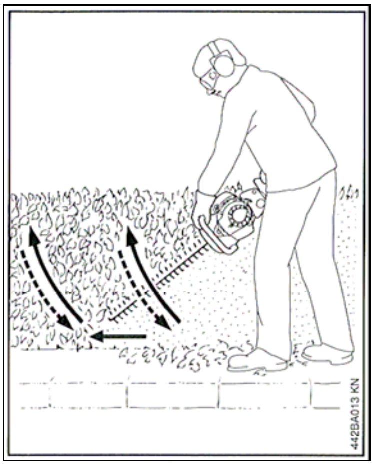


Figure 5a Horizontal cut technique **Figure 5b** Vertical cut technique

Diagrams used (with permission) from manufacturer's handbook

To allow for better control and comfort in all cutting situations, the rear handle on all of the hedge trimmers tested at HSL can be rotated through 90° as shown in Figure 6. The emission test calls for the operator to hold the machine as in the horizontal technique but without the motion. Further emission tests were carried out on all of the machines for one operator only, with the operator holding the hedge trimmer as in the vertical technique with the rear handle rotated through 90°. The cutting bar was engaged and the hedge trimmer itself was held stationary.

Figure 6 Rear handle rotated through 90°

The differences on the measured vibration magnitudes between the two techniques for racing are shown in Table 4.

Table 4 Differences between cutting techniques

	Horizontal		Vertical		% difference
	a	***K***	***a***	***K***	
Machine A	3.3	0.2	2.4	0.1	-27
Machine B	6.6	0.2	5.5	0.7	-17
Machine C	7.1	0.5	5.0	0.7	-30
Machine D	4.3	0.5	3.3	0.1	-23

Table 4 shows that the vertical cut configuration generates emission values that are between 17 and 30% lower than the horizontal cut configuration.

5 FIELD MEASUREMENTS

5.1 MEASUREMENT PROTOCOL

Following the laboratory emission test stage, the hedge trimmers were taken out on the HSL site, where they were used under three sets of conditions as shown in Figures 7a-c. Triaxial vibration measurements were made at the same mounting locations as in the emission tests (Figure 3). Three operators carried out the same operation, one after another. The conditions in Figure 7a involved both horizontal and vertical cutting techniques on a thick stemmed shrub. The conditions in Figure 7b involved both horizontal and vertical cutting techniques on a thinner stemmed shrub. The conditions in Figure 7c involved the vertical cutting technique on conifer, a much softer and easier foliage to cut.

Figure 7a Horizontal and vertical cut techniques on thick stemmed shrub

Figure 7b Horizontal and vertical cut techniques on thinner stemmed shrub

Figure 7c Vertical cut technique on conifer

5.2 DATA ACQUISITION AND ANALYSIS

Details of instrumentation used for acquisition and analysis of field measurement data is given in Appendix A.

Due to the highly mobile nature of the machines it was not possible to use the normal mains powered real time frequency analysis unit on site. The signals from the accelerometers were therefore recorded on a battery powered data recorder, then analysed using a B&K Pulse multi-channel frequency analyser when back at the laboratory at HSL. One-third octave band analyses of the data were carried out. The data were also frequency weighted in accordance with BS EN ISO 8041:2005 and then stored on the PC. The overall frequency weighted vibration magnitude at each measurement position was recorded after each test. The data acquisition instrumentation is shown in Figure 8.

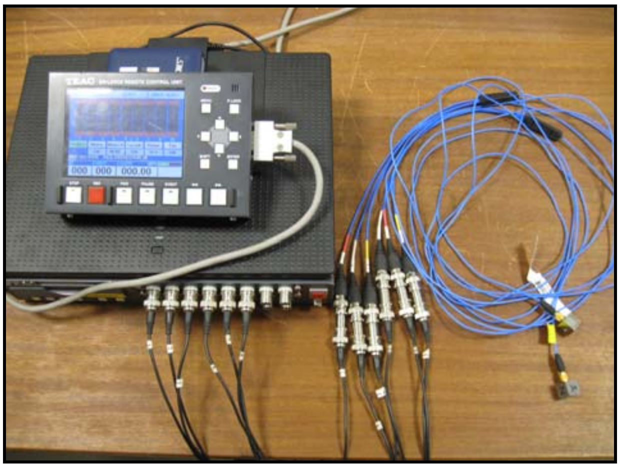


Figure 8 Data acquisition instrumentation

All of the measurements obtained for each of the hedge trimmers were then used to derive a mean frequency weighted vibration magnitude and standard deviation.

5.3 RESULTS OF FIELD MEASUREMENTS

The full results from the field measurements, including frequency spectra, are given in Appendix B. A summary of the overall results for each hedge trimmer is given in Table 5.

The '**Average**' conditions are the mean and standard deviation across all field measurements for that hedge trimmer. The **bold** values indicate the hand position with the highest measured vibration.

Table 5 Summary of field measurements on the hedge trimmers

Machine	Conditions	Frequency weighted vibration total values (m/s^2)				Number of measurements
		Front hand		Rear hand		
		mean	**stdev**	**mean**	**stdev**	
A	Cutting thick shrub	2.3	0.3	2.6	0.3	6
	Cutting thin shrub	2.5	0.3	3.0	0.2	3
	Cutting conifer	2.1	0.1	2.1	0.2	3
	Average	2.3	0.3	**2.6**	**0.4**	12
B	Cutting thick shrub	4.3	0.4	6.1	1.1	6
	Cutting thin shrub	4.0	0.4	7.0	0.7	3
	Cutting conifer	3.9	0.6	5.5	0.3	3
	Average	4.1	0.5	**6.2**	**1.0**	12
C	Cutting thick shrub	4.3	0.6	3.7	0.3	3
	Cutting thin shrub	4.9	0.7	4.2	0.6	3
	Cutting conifer	4.3	0.4	3.4	0.4	3
	Average	**4.5**	**0.6**	3.8	0.5	9
D	Cutting thick shrub	3.5	0.5	4.3	0.9	6
	Cutting thin shrub	3.6	0.3	3.6	0.4	3
	Cutting conifer	3.1	0.5	3.5	0.4	3
	Average	3.4	0.5	**3.9**	**0.8**	12

The upper quartile values for each hedge trimmer are given in Table 6. The **bold** values indicate the hand position with the highest measured vibration.

Table 6 Upper quartiles at both hand positions

Machine	Frequency weighted vibration total values (m/s^2)		Number of measurements
	Front hand upper quartile	Rear hand upper quartile	
A	2.5	**2.8**	12
B	4.6	**7.0**	12
C	**4.8**	4.0	9
D	3.8	**4.0**	12

6 DISCUSSION

6.1 COMPARISON OF DECLARED AND MEASURED EMISSION

BS EN 12096:1997 states that if just one machine is evaluated, the declared vibration emission is verified if the measured vibration emission, ***a***, is less than, or equal to the value of ***a + K*** as declared by the manufacturer.

Table 7 compares the measured and declared vibration emission for each machine and identifies the conditions under which the comparison has been made. Table 7 makes a verification assessment based on data averaged for three operators. Reference to Table 3 suggests that Machines B, C, and D would have failed the verification test on at least one occasion had one of the three operators been selected alone. The Standard test should require more than one operator to reduce the effect of the operator on test results.

Table 7 Comparison of declared emissions under BS EN 12096:1997

Machine	Manufacturer's declared emission (m/s^2)			Conditions	HSL measured emission (m/s^2)			HSL verifies
	a	***K***	***a+K***		***a***	***K***	***a+K***	
A	2.3	2.0	**4.3**	*Equivalent*	**3.0**	0.4	3.4	Y
B	4.2	2.1*	**6.3**	*Equivalent*	**6.6**	1.3	7.9	N
	4.5	2.3*	**6.8**	*Racing*	**6.8**	1.7	8.5	Y
C	4.6	0.5	**5.1**	*Racing*	**7.7**	1.3	9.0	N
D	3.0	1.5*	**4.5**	*Equivalent*	**4.2**	0.7	4.9	Y

* Value not provided so calculated as 0.5***a*** according to the provisions of BS EN 12096

During the emission tests HSL measured both *idling* and *racing* vibration total values in order to calculate an *equivalent* vibration total value. Doing so allowed verification to be made against both test codes, namely BS EN ISO 10517:2009 and BS EN 774:1996. HSL has used the most appropriate data for comparison with the manufacturers' data.

The manufacturer of Machine B has declared to BS EN 774:1996 and under those conditions (*racing*), the declaration has been verified. For Machine B a comparison has also been made under *equivalent* conditions, but the verification was not successful.

The results in Table 7 show that HSL has verified the manufacturers' declared vibration emissions in three out of four cases.

The C_v criterion of 0.4 for the hedge trimmers test is unusually large. A criterion of 0.15 is widely used for electrical and pneumatic powered hand-tools. Tests conducted here readily achieved C_v values of less than 0.15 and so a C_v criterion of less than 0.15 appears sufficient for hedge trimmer testing.

6.2 ANALYSIS OF VARIANCE

6.2.1 HSL measured emission

Analysis of variance (ANOVA) was carried out on the HSL emission data, to see which emission values could be considered as different and which could not. The statistical analysis was carried out for each possible combination of two machines using the vibration magnitudes at the same locations for each machine. The null hypothesis was that the two sets of 15 emission values obtained from the laboratory test (3 operators, 5 repeats) were not statistically separable at the 5% level, i.e. they had the same mean value. The results of the ANOVA analysis are shown in Table 8 and the data are represented graphically in Figure 9, where the standard deviation is plotted against the mean measured emission, ***a***. The mean is represented by a black diamond and the error bars indicate the standard deviation. Those machines that are not significantly different from one-another are circled.

From the results of the ANOVA analysis in Table 8 and Figure 9, it is possible to get an indication of the order of magnitude or the percentage difference that might represent a significant difference between two machines. This then enables informed judgements to be made as to whether the vibration magnitudes from two different machines can be considered as different and helps to identify any machines which stand out from the rest of the machines in the category as being particularly high or low vibration machines. Machines with low vibration emission may be representative of the state-of-the-art in terms of vibration control but this is a small sample of four machines.

Table 8 Results of the ANOVA analysis on *equivalent* emission values

	A	B	C	D
mean ***a***	3.0	6.6	7.1	4.2
std dev	0.4	1.3	1.2	0.7
A		s	s	s
B			ns	s
C				s
D				

's' is significantly different, 'ns' is not significantly different

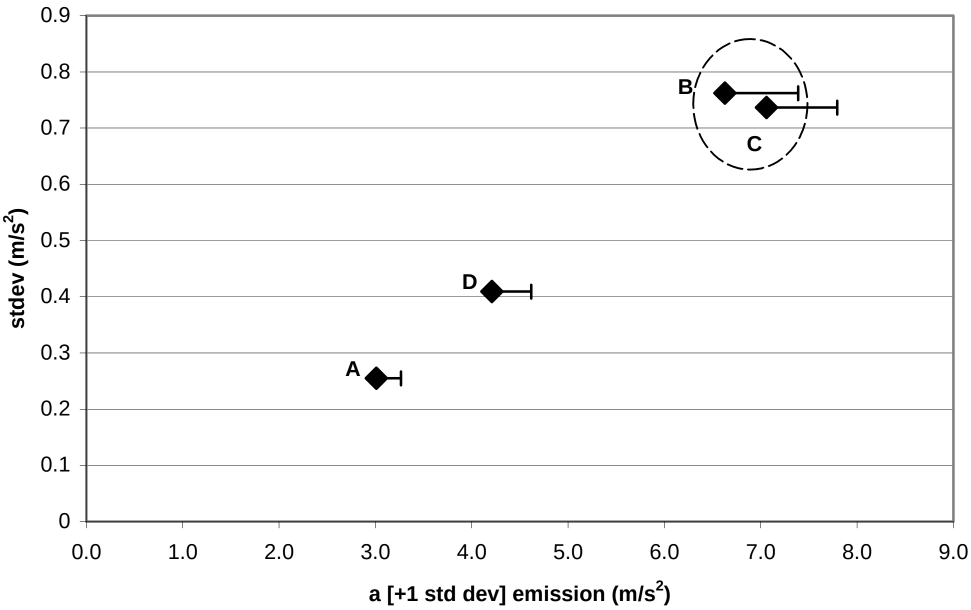


Figure 9 Mean ***a*** [+1 std dev] emission vs standard deviation for HSL measured vibration magnitudes. The oval indicates those machines which are not significantly different

Table 8 and Figure 9 show that the emission values of 7.1 m/s^2 and 6.6 m/s^2 for Machines B and C respectively are not significantly different. All other pairs of comparisons across the four machines show the mean vibration of the machines are significantly different.

6.2.2 Operator variations

ANOVA carried out on the data from different operators (Table 3) to investigate the effect of the operator on the measured vibration magnitude showed that the choice of operator is significant for 3 of the 4 hedge trimmers. Machine A is the only hedge trimmer where the variations are not significantly different as the absolute magnitudes are the most similar. This suggests that it is not appropriate to carry out the emission test procedure using only one operator. The reasons for the differences between operators have not been investigated. There were no obvious differences in posture or hand position during the emission tests, however there may be an effect relating to the physical characteristics of the operator's hand and arm or grip and feed forces used which influence the amount of damping that each individual operator applies.

6.3 COMPARISON OF DECLARED AND MEASURED EMISSION AND FIELD MEASUREMENTS

Figure 10 shows the manufacturer's declared emission, the HSL measured emission and the field measurement results for each measurement location on each hedge trimmer. The error bars represent the ***K*** values (reported in Table 2). For Machines A, B and D the manufacturers' declarations are based on the rear hand measurement location. It is not known from which measurement location the declaration for Machine C is based. When considering how well the result of the emission test compares with the upper quartile of the field measurements, it is important to bear in mind that the upper quartiles have been obtained from a relatively small data set.

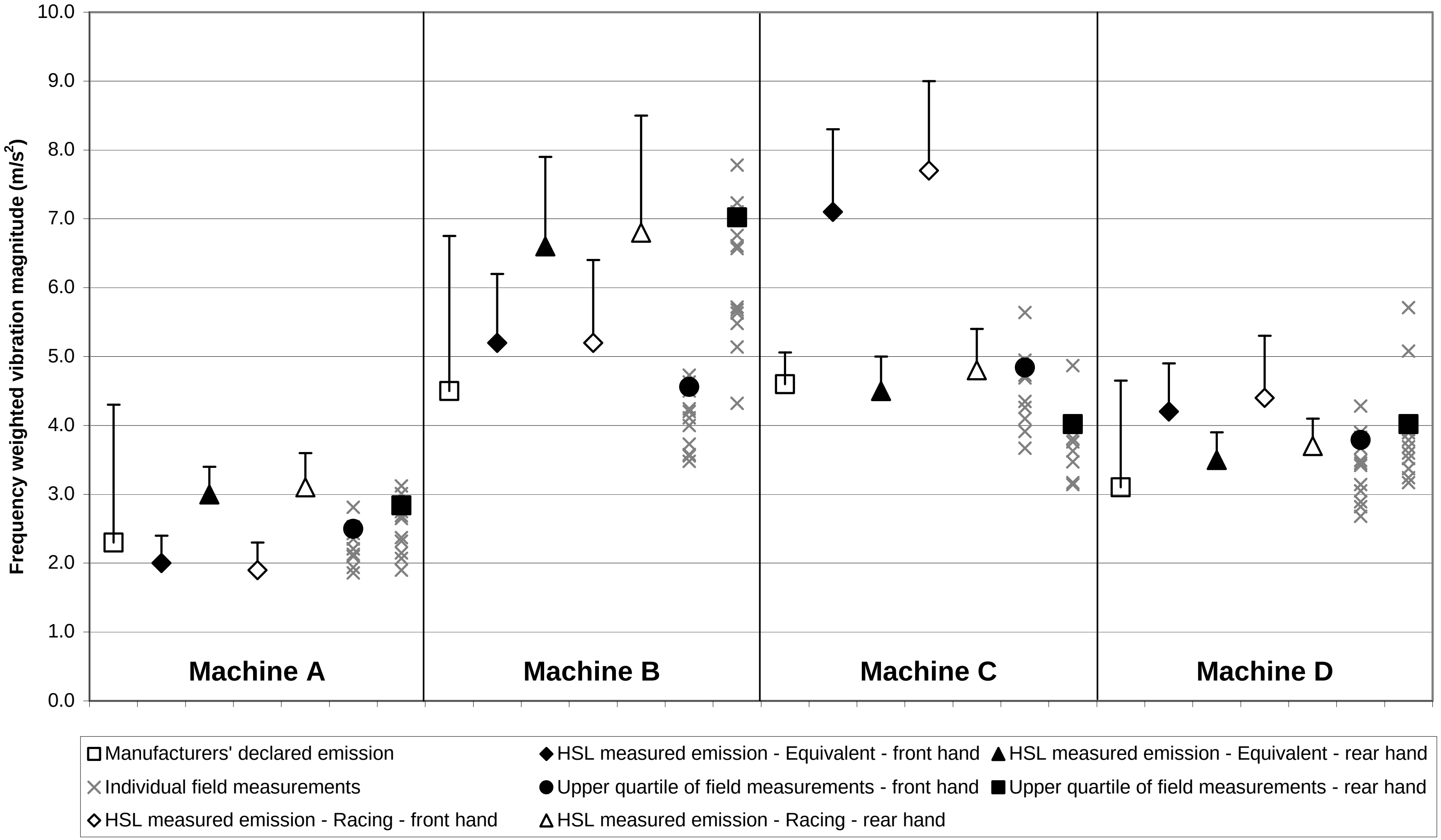


Figure 10 Comparison of manufacturers' declared and HSL measured emissions and field measurements

Figure 10 shows that for all of the hedge trimmers tested, the ***a + K*** values as measured by HSL are greater than the upper quartile values. The *racing* emission values are more comparable with the field measurements as the field measurements do not include any *idling*. The *idling* emission values are lower than the *racing* emission values for the hedge trimmers tested at HSL and it is not known how much idling occurs, if any, when hedge trimmers are used at work. Hedge trimming as observed at work during a different project (NV/10/06) involved no idling i.e. the operators were on the throttle 100% of the time. Despite the fact that the *equivalent* emission values contain 80% *racing* and 20% *idling*, the *equivalent* emission values determined by HSL are also greater than the upper quartile field values.

The differences in vibration magnitudes between horizontal and vertical techniques measured during the emission tests were not observed during the field measurements. During real use the operator is continually varying grip and posture and so consequently the conditions are less controlled and this may mask any differences between horizontal and vertical operation noticed in the emission tests.

Similar variations between operators were observed during both the emission and field tests. However, during the field tests there appeared to be larger variations. One of the operators reported fatigue towards the end of the trials – all completed on one day. A possible explanation is that fatigue and operator technique may bring about variations in the measured vibration magnitude.

6.4 EMISSION VALUES AS AN INDICATOR OF RISK

One of the requirements of BS EN ISO 20643:2008 is that emission test codes should be designed to produce values which reflect the upper quartile of the in-use magnitudes. The data measured at HSL according to BS EN ISO 10517:2009 have been compared with the upper quartile of the HSL measured in-use vibration data. To do this, the ratio of the HSL measured ***a*** emission to the upper quartile of in-use values measured at the transducer positions specified in BS EN ISO 10517:2009 has been calculated and shown in Figure 11.

In Figure 11, a ratio of 1 indicates that the ***a*** emission and upper quartile field magnitudes are the same and therefore a value of 1 on the y-axis can be seen as the target value. A value greater than 1 indicates that the emission value overestimates the upper quartile of field measurements. A value less than 1 indicates an underestimate. The error bar on each data point indicates the difference that adding the ***K*** value makes to the ratio. Figure 11 shows that for the highest measured value, for three of the hedge trimmers, the HSL measured ***a*** emission value overestimates the upper quartile field by less than 15%, before taking the ***K*** value into consideration. However, for the fourth hedge trimmer, the HSL measured ***a*** emission value overestimates the upper quartile field by approximately 50%, even before taking the ***K*** value into consideration. The vibration risk associated with the use of the machines is overestimated by up to 50%.

Figure 12 shows the ratio of the manufacturers' ***a*** emissions to the upper quartile value at the location of the highest measured value as specified in BS EN ISO 10517:2009. In practice users of the emission data are likely to receive the highest measured manufacturers' emission value to represent both hands. Figure 12 shows that if the manufacturers' data are compared to the upper quartile field magnitudes for the highest hand at the BS EN ISO 10517:2009 locations, only one of the manufacturers' ***a*** emission values approaches the upper quartile of in-use data. When the ***a+K*** value is used, the upper quartile is exceeded or adequately represented for all four machines. This shows that the use of existing manufacturers' ***a*** emission data for the purposes of risk assessment will result in an underestimate of the vibration risk associated with the use of the machine. However the ***a+K*** value will result in a reasonable estimate of the vibration risk.

In the case of Machine A, use of ***a+K*** results in a 50% overestimate but the magnitude of vibration is small relative to the other machines. HSL data suggests that a smaller value of ***K*** could be declared for Machine A.

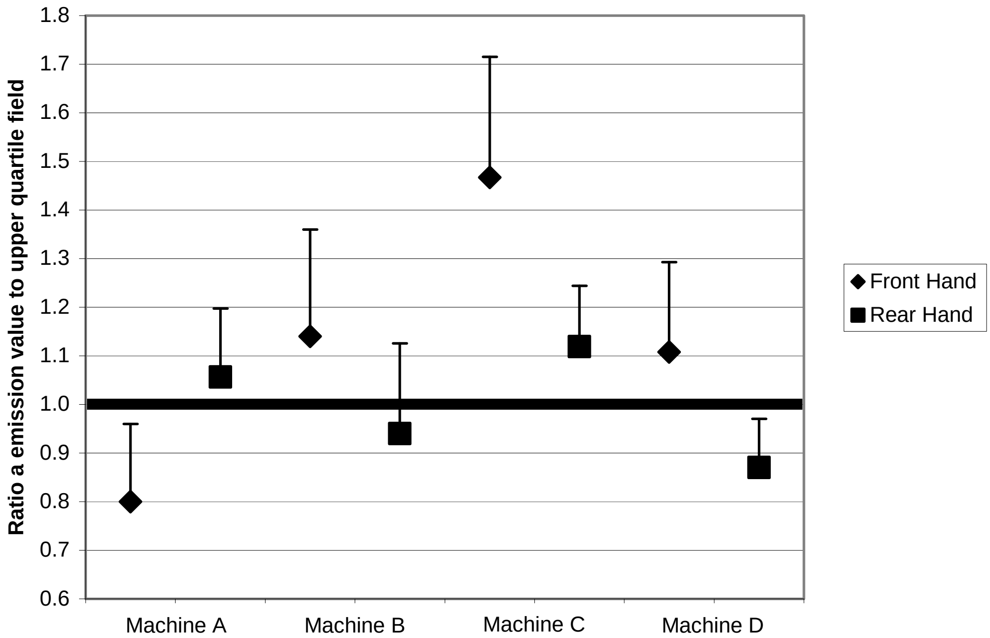


Figure 11 Ratio of HSL measured emission to the upper quartile field at the BS EN ISO 10517:2009 measurement locations

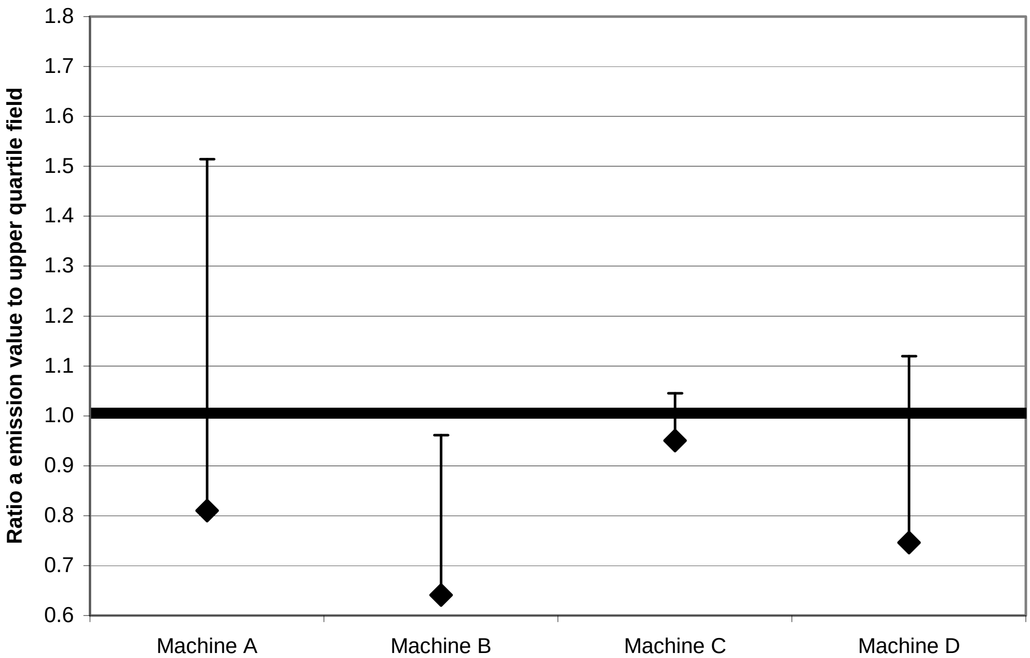


Figure 12 Ratio of the manufacturers' ***a*** emission to the highest hand upper quartile field at the BS EN ISO 10517:2009 measurement locations

7 CONCLUSIONS

Vibration emissions of hedge trimmers are sufficient to present an occupational risk of vibration injury.

Choosing between models of hedge trimmer on the basis of vibration emissions can help minimise the vibration risk.

Using the standard tests outlined in BS EN ISO 10517:2009 and BS EN 774:1996, manufacturers' declared emission values were verified according to the criteria in BS EN 12096:1997 in three out of the four cases. Of the three cases, two have been verified using *equivalent* vibration values and the other using *racing* vibration values

When comparing manufacturers' data with the upper quartile field magnitudes for the highest measured value at the BS EN ISO 10517:2009 locations, only one of the manufacturers' ***a*** emission values approaches the upper quartile of in-use data. However, when the ***a+K*** value is used, the upper quartile is exceeded or adequately represented for all four machines. This shows that the use of existing manufacturers' ***a*** emission data for the purposes of risk assessment will result in an underestimate of the vibration risk associated with the use of the machine. However, the ***a+K*** value gives a reasonable estimate of the vibration risk in three out of four cases. In the case of Machine A, use of ***a+K*** results in a 50% overestimate but the magnitude of vibration is small relative to the other machines. HSL data suggests that a smaller value of ***K*** could be declared for Machine A.

When comparing HSL measured emission values with the upper quartile field magnitude at the BS EN ISO 10517:2009 measurement locations, the upper quartile is slightly overestimated for three of the four hedge trimmers. For the fourth hedge trimmer the upper quartile is overestimated by approximately 50%, even before taking the ***K*** value into consideration. The vibration risk associated with the use of the machines is overestimated by up to 50%.

BS EN ISO 10517:2009 produces emission values which identify that Machines A and D are the better machines, consistent with the upper quartile vibration determined during normal use. The upper quartile value determined for Machine B suggests that this is the highest vibration machine. However, BS EN ISO 10517:2009 suggests that the vibration of Machines B and C is similar, contrary to findings from comparison of the upper quartile vibration. The test code inconsistently represents workplace vibration

Manufacturers appeared aware of the requirements of BS EN ISO 10517:2009 but none quoted the standard as the basis for their declarations.

ANOVA carried out on the HSL measured emission values indicates that mean values of 7.1 m/s^2 and 6.6 m/s^2 for Machines B and C respectively, are not significantly different. All other pairs of comparisons across the four machines show that the means are significantly different.

ANOVA carried out on the data investigating the effect of the operator concludes that the variations between operators are significant for three of the four hedge trimmers. This suggests that the emission test procedure in BS EN ISO 10517:2009 could be improved by specifying more than one operator.

The C_v criterion for hedge trimmers test is unusually large. A criterion of 0.15 is widely used for electrical and pneumatic powered hand-tools. Tests conducted here readily achieved C_v

values of less than 0.15 and so a C_v criterion of less than 0.15 appears sufficient for hedge trimmer testing.

The use of the *racing* and *idling* components makes the test more complicated but does not appear necessary for the machines tested as the *equivalent* and *racing* vibration values are very similar.

The differences in vibration magnitudes between horizontal and vertical techniques measured during the emission tests were not observed during the field measurements. During real use the operator is continually varying grip and posture and so consequently the conditions are less controlled. This regular change in grip masks any differences between horizontal and vertical operation noticed in the emission tests.

Similar variations between operators were observed during both the emission and field tests. However, during the field tests there appeared to be larger variations for the heaviest hedge trimmers. One of the operators reported fatigue towards the end of the trials – all completed on one day. A possible explanation is that fatigue and operator technique may bring about variations in the measured vibration magnitude.

8 RECOMMENDATIONS

The reason for the test code's inconsistent representation of workplace vibration should be investigated.

BS EN ISO 10517:2009 should be revised to require three operators to carry out the emission test. The use of only one operator is not valid as a main source of variation of the vibration magnitude is from the operator.

The C_v criterion should also be reduced from the current specification of 'Less than 0.4'. Setting a criterion of 'Less than 0.15', as widely used in pneumatic and electrical standards seems sufficient.

Measuring while the hedge trimmer is *idling* does not appear necessary and should be removed, as it only makes the emission test more complicated.

HSE should advise users to take the manufacturers' ***a+K*** values as indicators of likely in-use vibration values for hedge trimming.

9 REFERENCES

BS EN ISO 10517:2009. Powered hand-held hedge trimmers – Safety.

BS EN 774:1996. Garden equipment – Hand held, integrally powered hedge trimmers – Safety.

BS EN ISO 22867:2008. Forestry machinery – Vibration test code for portable hand-held machines with internal combustion engine – Vibration at the handles.

BS EN 12096:1997. Mechanical vibration – Declaration and verification of vibration emission values.

BS EN ISO 20643:2008. Mechanical vibration – Hand-held and hand-guided machinery – Principles for evaluation of vibration emission.

Supply of Machinery (Safety) Regulations 2008. S.I. No.1597

BS EN ISO 8041:2005. Human response to vibration – Measuring instrumentation.

Council Directive 2006/42/EC of the European Parliament and of the Council of 7th May on machinery, and amending Directive 95/16/EC (recast).

Pitts PM (2004). NV/04/04 - Hand-arm vibration emission of chainsaws – comparison with vibration exposure.

Pitts PM (2001). NV/01/16 - Hand-arm vibration exposure of brush cutter operators.

Heaton RT (2010). NV/10/06 - Vibration measurements on grounds maintenance machinery at South Derbyshire Council.

APPENDICES

APPENDIX A – DATA AQUISTION AND ANALYSIS EQUIPMENT

Vibration emission data

	Transducers ICP Type	Serial #	Sensitivity (mV/ms^{-2})	Date of last calibration
Ch1	356A02	15793	1.060	August 2010
Ch2			1.047	
Ch3			1.056	
Ch4	356A02	97450	1.036	August 2010
Ch5			1.033	
Ch6			1.030	
B&K Pulse 3560C (Serial # 2423351) B&K Pulse LabShop software v12.1.0				Janurary 2010
Calibrator B&K 4294 (Serial # 1121535)				November 2010

Field measurement data

Data recording equipment

	Transducers ICP Type	Serial #	Sensitivity (mV/ms^{-2})	Date of last calibration
Ch1	356A02	15793	1.060	August 2010
Ch2			1.047	
Ch3			1.056	
Ch4	356A02	97450	1.036	August 2010
Ch5			1.033	
Ch6			1.030	
TEAC LX10 data recorder (Serial # 107562)				September 2010
Calibrator B&K 4294 (Serial # 1121535)				November 2010

Data analysis equipment

B&K Pulse 3560C (Serial # 2423351) B&K Pulse LabShop software v12.1.0	January 2010

APPENDIX B – DETAILED MEASUREMENT RESULTS

Vibration Emission Test report - Full

Standard: BS EN ISO 10517:2009
N&V reference ID: Machine A Idling
Measurement File name:

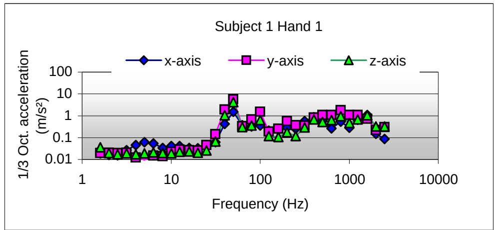
					Hand Position 1 - Support							Hand Position 2 - Throttle						
									Operator Statistics							Operator Statistics		
TestNo.	Operator	Meas. Name	Meas. Date	Meas Time	a_{whx}	a_{why}	a_{whz}	a_{hv}	Mean a_{hv}	S_{n-1}	C_v	a_{whx}	a_{why}	a_{whz}	a_{hv}	Mean a_{hv}	S_{n-1}	C_v
1	1	RH1 idle	0/06/201	14:13:25:998	0.72	1.87	2.03	2.85				2.53	2.66	0.65	3.72			
2	1	RH2 idle	0/06/201	14:14:28:749	0.50	2.12	1.33	2.56				2.21	1.69	0.90	2.92			
3	1	RH3 idle	0/06/201	14:15:24:374	0.52	2.21	1.15	2.55	2.57	0.165	0.064	2.18	1.68	1.11	2.97	3.14	0.332	0.106
4	1	RH4 idle	0/06/201	14:16:23:874	0.52	2.03	1.31	2.47				2.03	1.92	1.09	3.00			
5	1	RH5 idle	0/06/201	14:17:25:874	0.55	1.93	1.37	2.44				2.01	2.05	1.08	3.06			
6	2	MM1 idle	0/06/201	14:08:24:624	0.71	1.28	1.90	2.40				1.72	2.63	0.88	3.27			
7	2	MM2 idle	0/06/201	14:09:17:249	0.89	1.91	1.61	2.65				2.46	2.48	0.55	3.54			
8	2	MM3 idle	0/06/201	14:10:10:373	0.94	1.68	1.65	2.53	2.41	0.216	0.090	2.18	2.51	0.68	3.39	3.11	0.443	0.142
9	2	MM4 idle	0/06/201	14:11:02:124	0.98	1.50	1.57	2.38				1.84	2.14	0.71	2.91			
10	2	MM5 idle	0/06/201	14:11:53:373	0.51	1.51	1.32	2.07				1.64	1.53	0.94	2.43			
11	3	PP1 idle	0/06/201	14:02:45:499	0.66	1.44	1.52	2.20				2.27	2.16	0.68	3.20			
12	3	PP2 idle	0/06/201	14:03:38:748	0.51	1.75	1.22	2.19				2.15	1.63	1.02	2.88			
13	3	PP3 idle	0/06/201	14:04:31:498	0.42	1.70	1.08	2.05	2.09	0.094	0.045	1.69	1.62	1.23	2.65	2.77	0.289	0.104
14	3	PP4 idle	0/06/201	14:05:23:498	0.41	1.77	0.84	2.00				1.51	1.45	1.24	2.43			
15	3	PP5 idle	0/06/201	14:06:15:499	0.55	1.60	1.10	2.02				1.56	1.91	1.06	2.69			

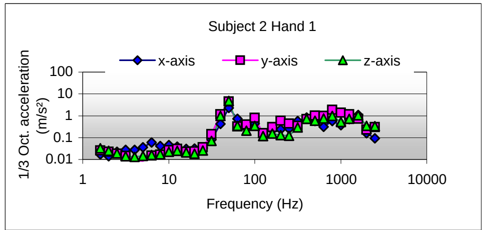
	Hand Position 1 - Support			Hand Position 2 - Throttle		
	a_h (overall mean a_{hv}) :	2.36	m/s²	a_h (overall mean a_{hv}):	3.01	m/s²
	$\sigma_{R(single\ m/c.)}$:	0.30	m/s²	$\sigma_{R(single\ m/c.)}$:	0.52	m/s²
	$K_{(single\ m/c.)}$ value:	0.50	m/s²	$K_{(single\ m/c.)}$ value:	0.85	m/s²

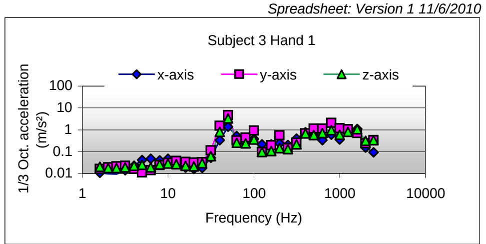
Single machine declared emission a_{hd} (= greatest a_h value): 3.01 m/s² **$K_{(single\ m/c.)}$ value: 0.85 m/s²**

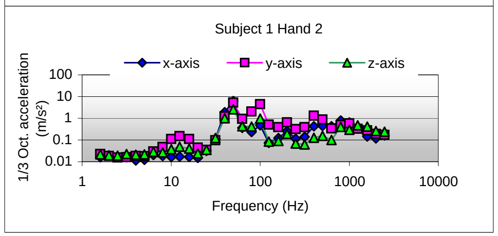
Pulse file version: Hedge trimmer emission - Dual triggered averaging time V1.0 2010-06-11.pls

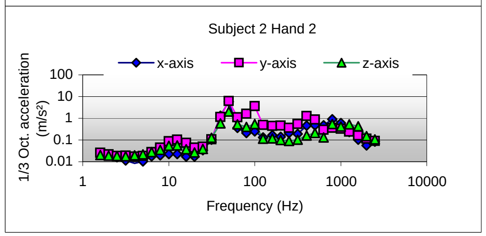
Spreadsheet: Version 1 11/6/2010

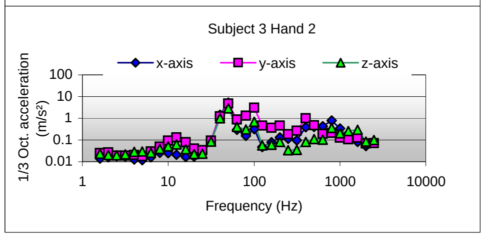












Vibration Emission Test report - Full

Standard: BS EN ISO 10517:2009
N&V reference ID: Machine A Racing
Measurement File name:

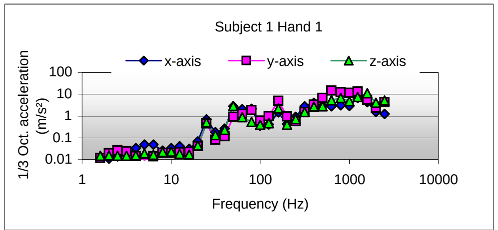
					Hand Position 1 - Support							Hand Position 2 - Throttle						
									Operator Statistics							Operator Statistics		
TestNo.	Operator	Meas. Name	Meas. Date	Meas Time	a_{whx}	a_{why}	a_{whz}	a_{hv}	Mean a_{hv}	S_{n-1}	C_v	a_{whx}	a_{why}	a_{whz}	a_{hv}	Mean a_{hv}	S_{n-1}	C_v
1	1	H1 racir	9/06/201	15:18:24:623	1.25	0.98	0.97	1.86				1.89	2.73	0.72	3.39			
2	1	H2 racir	9/06/201	15:19:24:998	1.34	1.07	0.98	1.97				1.60	2.93	0.71	3.41			
3	1	H3 racir	9/06/201	15:20:22:748	1.28	1.01	1.20	2.03	1.96	0.063	0.032	1.56	2.88	0.70	3.35	3.31	0.127	0.038
4	1	H4 racir	9/06/201	15:21:21:373	1.26	1.00	1.12	1.96				1.57	2.58	0.65	3.09			
5	1	H5 racir	9/06/201	15:22:20:623	1.24	0.98	1.20	1.98				1.71	2.73	0.71	3.30			
6	2	M1 racir	9/06/201	15:25:09:749	1.16	1.49	0.85	2.07				1.70	2.67	0.83	3.27			
7	2	M2 racir	9/06/201	15:26:02:624	1.28	1.52	0.78	2.13				1.74	2.49	0.77	3.14			
8	2	M3 racir	9/06/201	15:26:56:874	1.34	1.45	0.70	2.10	2.18	0.121	0.055	1.72	2.16	0.70	2.84	3.07	0.175	0.057
9	2	M4 racir	9/06/201	15:27:50:874	1.53	1.47	0.73	2.25				1.72	2.28	0.71	2.94			
10	2	M5 racir	9/06/201	15:28:44:874	1.62	1.45	0.93	2.36				1.63	2.59	0.82	3.17			
11	3	P1 racir	9/06/201	15:30:48:874	0.76	1.14	0.80	1.59				1.40	2.35	0.85	2.87			
12	3	P2 racir	9/06/201	15:31:45:248	0.82	1.11	0.74	1.57				1.33	2.22	0.81	2.71			
13	3	P3 racir	9/06/201	15:32:40:749	0.84	1.13	0.76	1.60	1.61	0.029	0.018	1.51	2.32	0.88	2.91	2.77	0.107	0.038
14	3	P4 racir	9/06/201	15:33:52:499	0.88	1.15	0.77	1.64				1.46	2.12	0.93	2.74			
15	3	P5 racir	9/06/201	15:34:46:249	0.90	1.16	0.72	1.63				1.38	2.09	0.88	2.65			

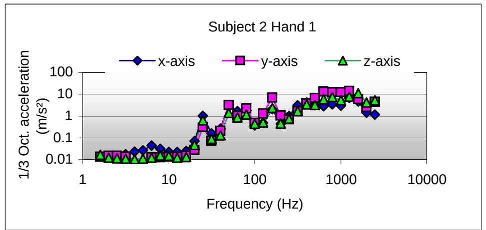
	Hand Position 1 - Support			Hand Position 2 - Throttle		
	a_h (overall mean a_{hv}) :	1.92	m/s²	a_h (overall mean a_{hv}):	3.05	m/s²
	$\sigma_{R(single\ m/c.)}$:	0.27	m/s²	$\sigma_{R(single\ m/c.)}$:	0.29	m/s²
	$K_{(single\ m/c.)}$ value:	0.44	m/s²	$K_{(single\ m/c.)}$ value:	0.48	m/s²

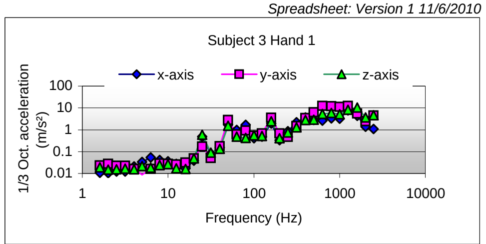
Single machine declared emission a_{hd} (= greatest a_h value): 3.05 m/s² **$K_{(single\ m/c.)}$ value: 0.48 m/s²**

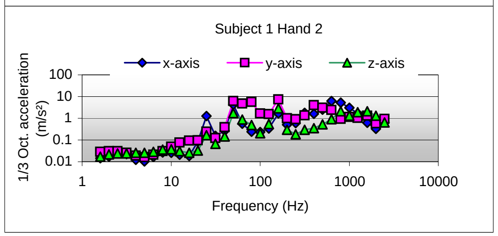
Pulse file version: Hedge trimmer emission - Dual triggered averaging time V1.0 2010-06-11.pls

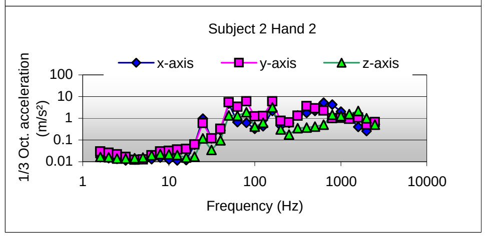
Spreadsheet: Version 1 11/6/2010

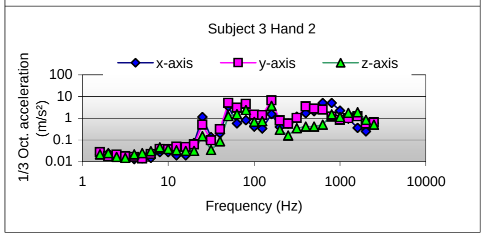






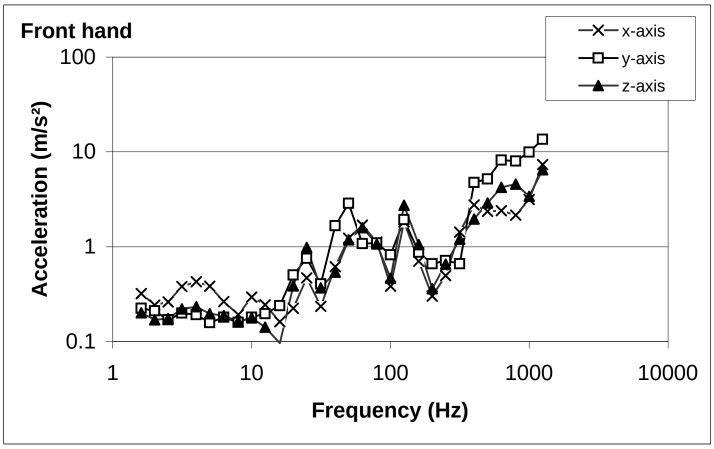


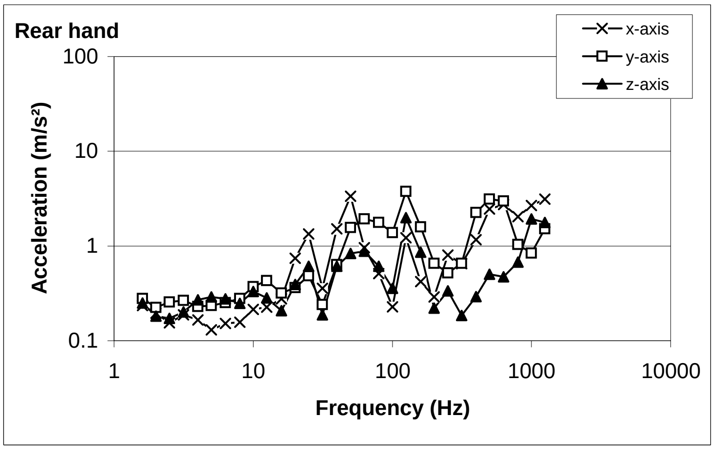


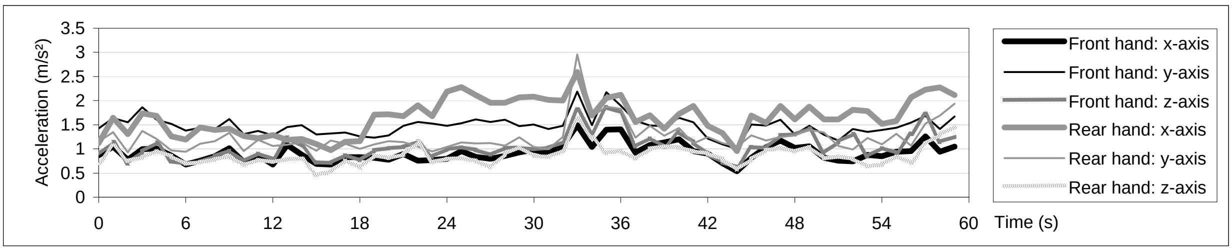


LocationName:	[redacted]	MachineManufacturer: MachineModel:	[redacted]		
				HSLAnonymisedToolLetter:	Machine A
Occupation:	Grounds Maintenance				
Process:	Cutting thick shrub	MachineModifications:			
RecordDate:	October 20, 2010	MachineSize:	600mm blade	MainID:	1377
		MachineWeight(kg):	5.6	ResultsID:	9976
TapeNumber:	N/A	MachineOperating pressure:			
Operator#:	OP#1	MachineSpeed(impacts/min):			
	Horizontal operation	MachineSpeed(revs/min):			
VideoNumber:	N/A	MachinePower:			
		MachinePower source:	2 stroke oil mix	MeasurementTime:	60 Seconds
Notes:				NumShotsInMeas:	
		InsertedTool:		DailyExposureTime:	
DC-shift threshold:	*10 mm*	InsertedToolType:		A(8) Front hand	m/s²
		InsertedToolManufacturer:	[redacted]		

	Front hand			Rear hand		
Frequency	x-axis	y-axis	z-axis	x-axis	y-axis	z-axis
1.6	0.321	0.224	0.202	0.235	0.278	0.249
2	0.242	0.212	0.17	0.196	0.224	0.181
2.5	0.263	0.169	0.175	0.154	0.255	0.172
3.15	0.38	0.2	0.221	0.187	0.265	0.201
4	0.429	0.191	0.234	0.166	0.23	0.27
5	0.382	0.158	0.197	0.131	0.235	0.29
6.3	0.263	0.18	0.187	0.152	0.253	0.276
8	0.192	0.16	0.163	0.157	0.279	0.249
10	0.293	0.181	0.178	0.215	0.373	0.332
12.5	0.244	0.196	0.142	0.227	0.432	0.284
16	0.162	0.238	0.096	0.277	0.318	0.208
20	0.225	0.503	0.386	0.741	0.362	0.392
25	0.469	0.755	0.98	1.339	0.486	0.61
31.5	0.235	0.405	0.37	0.358	0.24	0.187
40	0.614	1.662	0.541	1.512	0.637	0.613
50	1.229	2.868	1.18	3.364	1.563	0.836
63	1.692	1.08	1.594	0.958	1.927	0.882
80	1.123	1.096	1.074	0.513	1.771	0.609
100	0.383	0.82	0.467	0.228	1.384	0.358
125	1.823	1.937	2.741	1.223	3.78	1.996
160	0.702	0.872	1.056	0.42	1.585	0.862
200	0.302	0.661	0.36	0.29	0.654	0.22
250	0.494	0.716	0.653	0.802	0.518	0.337
315	1.422	0.661	1.201	0.65	0.656	0.184
400	2.761	4.753	1.96	1.168	2.258	0.292
500	2.359	5.163	2.892	2.448	3.124	0.505
630	2.395	8.183	4.226	2.73	2.976	0.471
800	2.144	7.981	4.57	2.045	1.033	0.677
1000	3.153	9.944	3.416	2.672	0.842	1.932
1250	7.365	13.58	6.503	3.129	1.515	1.778
ahw	**0.998**	**1.519**	**1.113**	**1.7**	**1.3**	**0.9**
av		**2.1**			**2.4**	



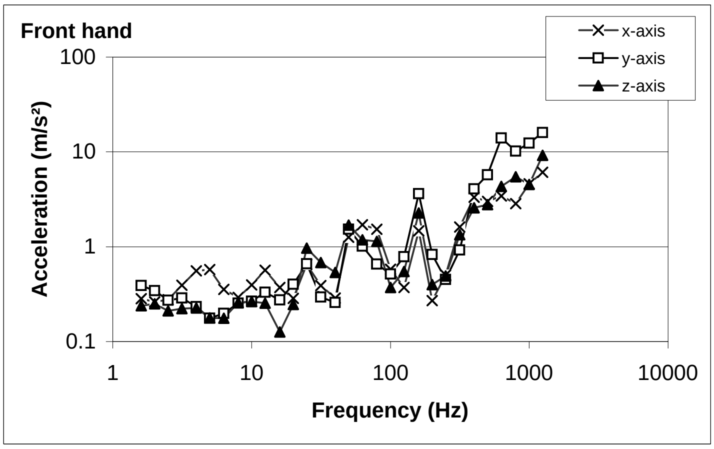


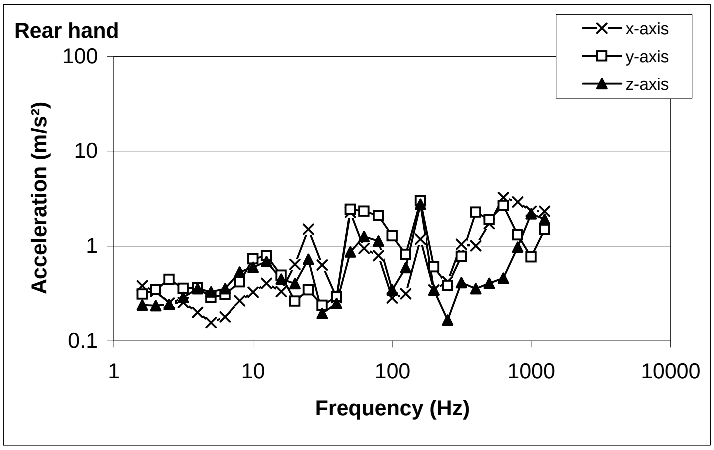


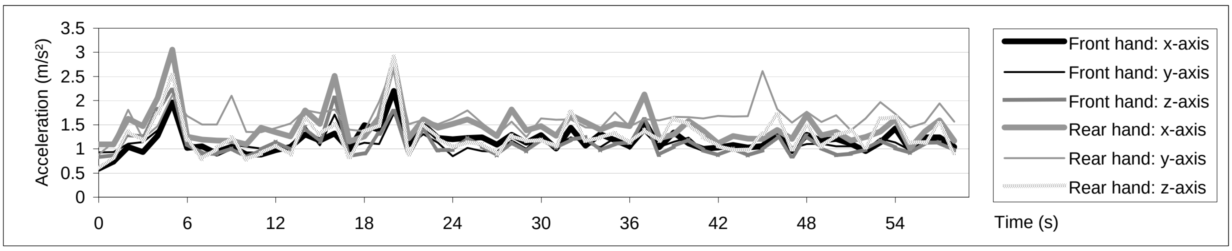
MainID: 1377, ResultsID: 9976

LocationName:		MachineManufacturer:	
		MachineModel:	
Occupation:	Grounds Maintenance	HSLAnonymisedToolLetter:	Machine A
Process:	Cutting thick shrub	MachineModifications:	
RecordDate:	October 20, 2010	MachineSize:	600mm blade
		MainID:	1377
		MachineWeight(kg):	5.6
		ResultsID:	9977
TapeNumber:	N/A	MachineOperating pressure:	
Operator#:	OP#2	MachineSpeed(impacts/min):	
	Horizontal operation	MachineSpeed(revs/min):	
VideoNumber:	N/A	MachinePower:	
		MachinePower source:	2 stroke oil mix
		MeasurementTime:	59.5 Seconds
Notes:		NumShotsInMeas:	
		InsertedTool:	
		DailyExposureTime:	
DC-shift threshold:	*10 mm*	InsertedToolType:	
		A(8) Front hand	m/s²
		InsertedToolManufacturer:	

	Front hand			Rear hand		
Frequency	x-axis	y-axis	z-axis	x-axis	y-axis	z-axis
1.6	0.284	0.39	0.239	0.382	0.311	0.238
2	0.262	0.344	0.25	0.333	0.348	0.235
2.5	0.278	0.273	0.211	0.249	0.446	0.243
3.15	0.392	0.287	0.223	0.254	0.358	0.287
4	0.558	0.234	0.225	0.2	0.362	0.356
5	0.573	0.176	0.177	0.155	0.287	0.329
6.3	0.356	0.198	0.176	0.179	0.308	0.355
8	0.293	0.254	0.258	0.264	0.417	0.533
10	0.396	0.266	0.265	0.325	0.731	0.595
12.5	0.565	0.331	0.255	0.405	0.79	0.684
16	0.371	0.275	0.126	0.331	0.491	0.448
20	0.286	0.401	0.247	0.642	0.262	0.402
25	0.649	0.659	0.97	1.5	0.345	0.726
31.5	0.389	0.294	0.682	0.632	0.237	0.195
40	0.287	0.258	0.537	0.284	0.293	0.249
50	1.256	1.525	1.686	2.273	2.434	0.865
63	1.706	1.011	1.18	0.942	2.324	1.263
80	1.528	0.655	1.134	0.793	2.092	1.13
100	0.579	0.514	0.373	0.283	1.277	0.344
125	0.373	0.783	0.548	0.314	0.816	0.593
160	1.476	3.631	2.273	1.186	2.992	2.76
200	0.269	0.826	0.399	0.345	0.602	0.345
250	0.504	0.452	0.492	0.422	0.384	0.165
315	1.613	0.923	1.338	1.045	0.779	0.411
400	3.321	4.069	2.577	1.006	2.279	0.355
500	3.016	5.716	2.777	1.724	1.899	0.405
630	3.434	13.98	4.347	3.238	2.68	0.458
800	2.856	10.19	5.456	2.91	1.304	0.974
1000	4.596	12.36	4.545	2.322	0.768	2.184
1250	6.102	15.96	9.212	2.324	1.496	1.91
ahw	**1.284**	**1.176**	**1.179**	**1.6**	**1.7**	**1.4**
av		**2.1**			**2.7**	



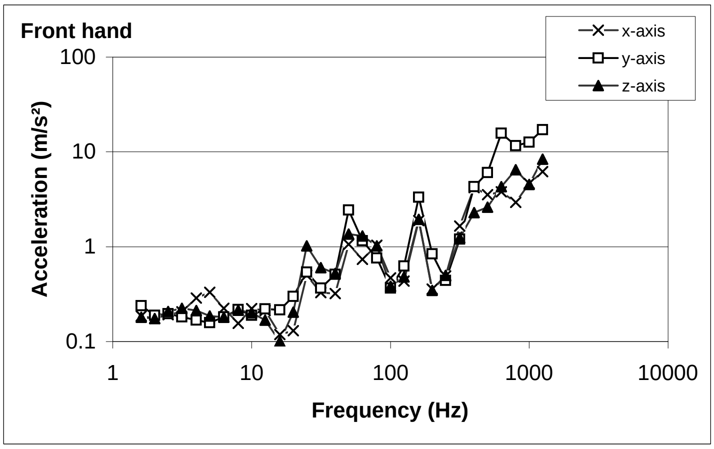


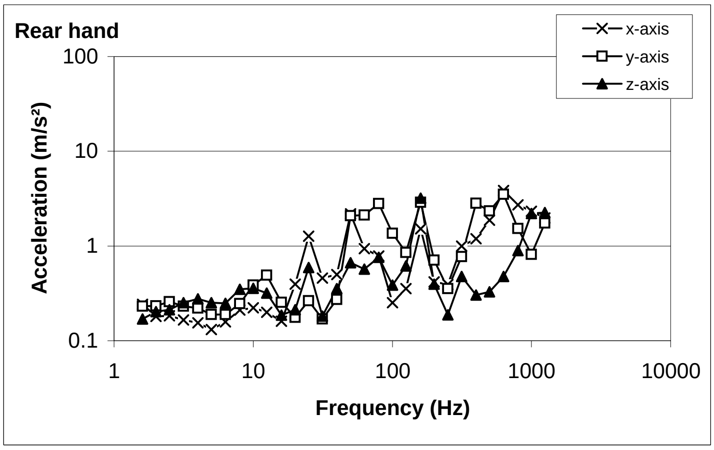


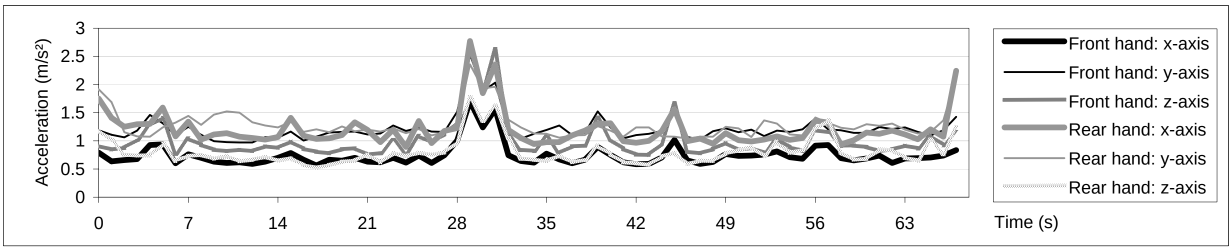
MainID: 1377, ResultsID: 9977

LocationName:	[redacted]	MachineManufacturer:	[redacted]
		MachineModel:	
Occupation:	Grounds Maintenance	HSLAnonymisedToolLetter:	Machine A
Process:	Cutting thick shrub	MachineModifications:	
RecordDate:	October 20, 2010	MachineSize:	600mm blade
		MainID:	1377
		MachineWeight(kg):	5.6
		ResultsID:	9978
TapeNumber:	N/A	MachineOperating pressure:	
Operator#:	OP#3	MachineSpeed(impacts/min):	
	Horizontal operation	MachineSpeed(revs/min):	
VideoNumber:	N/A	MachinePower:	
		MachinePower source:	2 stroke oil mix
		MeasurementTime:	68.25 Seconds
Notes:		NumShotsInMeas:	
		InsertedTool:	
		DailyExposureTime:	
DC-shift threshold:	*10 mm*	InsertedToolType:	
		A(8) Front hand	m/s²
		InsertedToolManufacturer:	[redacted]

	Front hand			Rear hand		
Frequency	x-axis	y-axis	z-axis	x-axis	y-axis	z-axis
1.6	0.187	0.238	0.181	0.243	0.232	0.17
2	0.174	0.19	0.175	0.181	0.233	0.203
2.5	0.191	0.197	0.208	0.183	0.258	0.213
3.15	0.206	0.182	0.224	0.165	0.232	0.252
4	0.288	0.169	0.212	0.155	0.221	0.276
5	0.332	0.158	0.186	0.131	0.189	0.253
6.3	0.224	0.182	0.18	0.158	0.189	0.247
8	0.156	0.218	0.215	0.21	0.247	0.349
10	0.223	0.189	0.201	0.223	0.385	0.359
12.5	0.213	0.222	0.168	0.199	0.493	0.319
16	0.119	0.216	0.1	0.161	0.255	0.186
20	0.13	0.3	0.204	0.394	0.176	0.213
25	0.5	0.538	1.019	1.267	0.264	0.594
31.5	0.327	0.365	0.6	0.458	0.17	0.182
40	0.32	0.51	0.524	0.5	0.272	0.355
50	1.062	2.432	1.36	2.193	2.093	0.665
63	0.735	1.16	1.294	0.94	2.124	0.57
80	1.038	0.76	1.021	0.783	2.803	0.762
100	0.47	0.365	0.383	0.252	1.358	0.386
125	0.435	0.623	0.479	0.354	0.851	0.614
160	1.884	3.32	1.947	1.518	2.902	3.193
200	0.357	0.841	0.348	0.417	0.707	0.394
250	0.49	0.44	0.499	0.391	0.356	0.188
315	1.653	1.203	1.24	0.995	0.773	0.477
400	4.207	4.31	2.288	1.195	2.82	0.303
500	3.551	6.052	2.608	1.873	2.349	0.329
630	3.806	15.79	4.289	3.853	3.505	0.475
800	2.934	11.6	6.51	2.716	1.527	0.895
1000	4.63	12.66	4.541	2.333	0.812	2.204
1250	6.198	17.13	8.366	1.971	1.747	2.248
ahw	**0.814**	**1.272**	**1.094**	**1.3**	**1.3**	**0.9**
av		**1.9**			**2.1**	



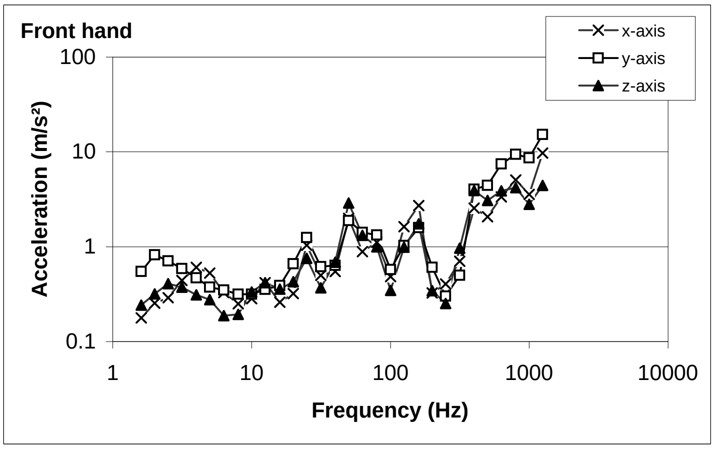


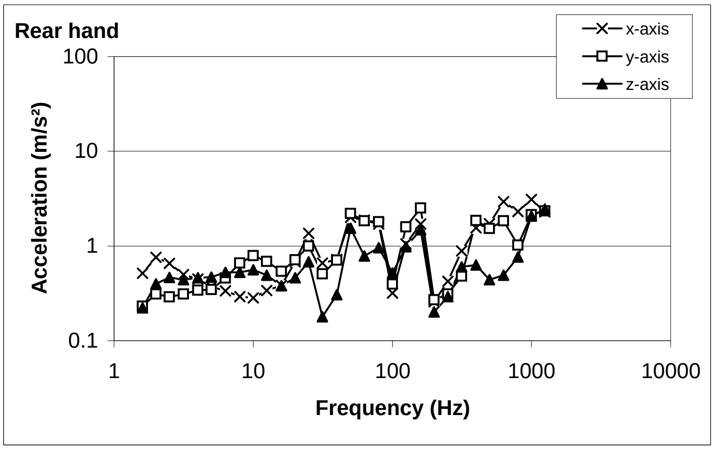


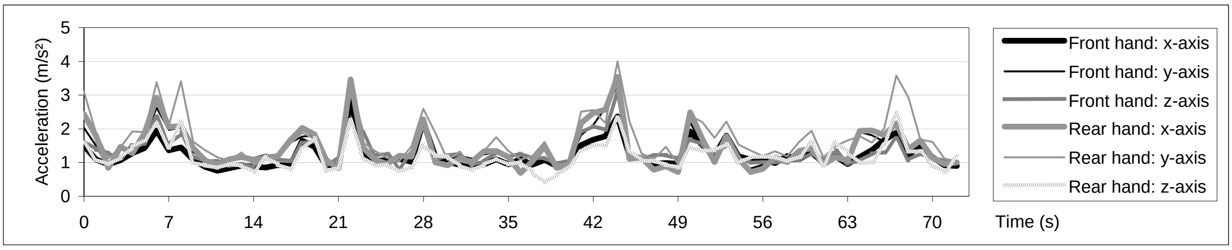
MainID: 1377, ResultsID: 9978

LocationName:		MachineManufacturer:	
		MachineModel:	
Occupation:	Grounds Maintenance	HSLAnonymisedToolLetter:	Machine A
Process:	Cutting thick shrub	MachineModifications:	
RecordDate:	October 20, 2010	MachineSize:	600mm blade
		MainID:	1378
		MachineWeight(kg):	5.6
		ResultsID:	9979
TapeNumber:	N/A	MachineOperating pressure:	
Operator#:	OP#1	MachineSpeed(impacts/min):	
	Vertical operation	MachineSpeed(revs/min):	
VideoNumber:	N/A	MachinePower:	
		MachinePower source:	2 stroke oil mix
		MeasurementTime:	73 Seconds
Notes:		NumShotsInMeas:	
		InsertedTool:	
		DailyExposureTime:	
DC-shift threshold:	*10 mm*	InsertedToolType:	
		A(8) Front hand	m/s²
		InsertedToolManufacturer:	

	Front hand			Rear hand		
Frequency	x-axis	y-axis	z-axis	x-axis	y-axis	z-axis
1.6	0.178	0.55	0.242	0.517	0.231	0.223
2	0.254	0.822	0.319	0.758	0.312	0.399
2.5	0.29	0.71	0.407	0.656	0.289	0.466
3.15	0.441	0.586	0.375	0.498	0.311	0.442
4	0.608	0.471	0.31	0.448	0.34	0.461
5	0.527	0.375	0.276	0.371	0.347	0.468
6.3	0.327	0.35	0.188	0.335	0.46	0.526
8	0.25	0.315	0.194	0.292	0.661	0.529
10	0.282	0.316	0.334	0.283	0.792	0.563
12.5	0.418	0.354	0.417	0.338	0.688	0.494
16	0.259	0.39	0.359	0.384	0.54	0.382
20	0.322	0.658	0.429	0.683	0.712	0.46
25	1.039	1.245	0.757	1.366	0.997	0.681
31.5	0.5	0.618	0.368	0.663	0.509	0.179
40	0.548	0.636	0.688	0.72	0.708	0.305
50	1.997	1.887	2.891	2.008	2.201	1.538
63	0.89	1.414	1.315	1.872	1.847	0.786
80	1.11	1.332	1.001	1.702	1.806	0.957
100	0.485	0.577	0.346	0.318	0.396	0.517
125	1.627	1.031	0.991	1.056	1.584	0.981
160	2.717	1.594	1.743	1.699	2.519	1.481
200	0.326	0.606	0.344	0.258	0.27	0.201
250	0.403	0.302	0.251	0.423	0.31	0.293
315	0.703	0.5	0.965	0.886	0.479	0.603
400	2.561	4.033	3.922	1.557	1.85	0.629
500	2.078	4.419	3.085	1.715	1.533	0.441
630	3.362	7.479	3.897	2.946	1.844	0.491
800	5.074	9.397	4.205	2.311	1.017	0.764
1000	3.553	8.676	2.809	3.091	2.133	2.078
1250	9.739	15.27	4.432	2.287	2.337	2.462
ahw	**1.364**	**1.563**	**1.438**	**1.6**	**1.9**	**1.4**
av		**2.5**			**2.8**	



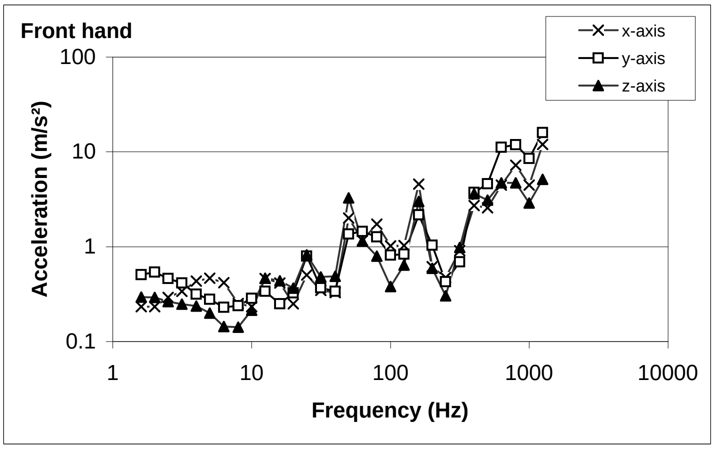


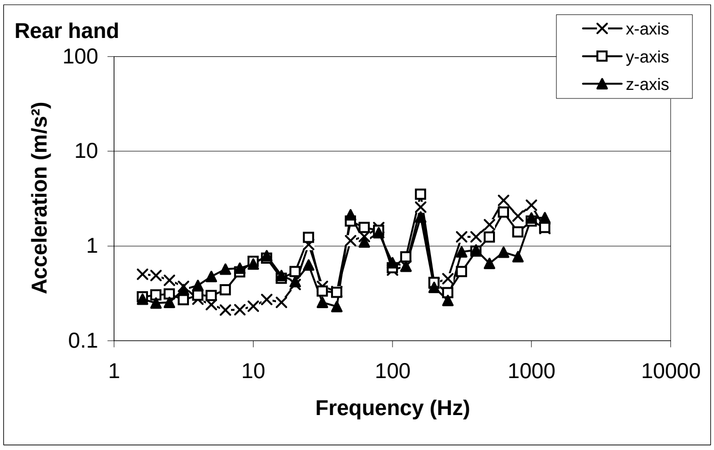


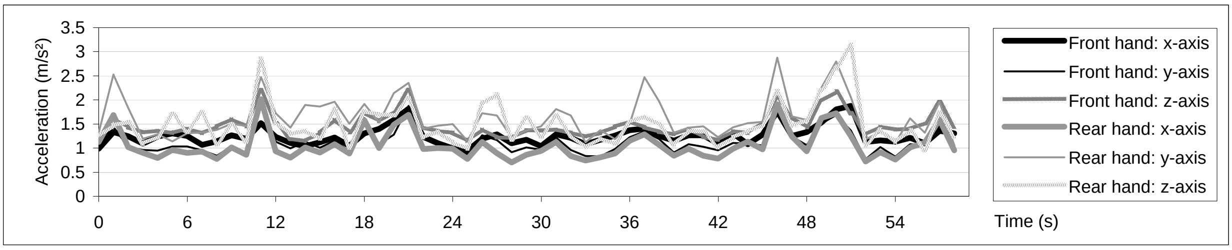
MainID: 1378, ResultsID: 9979

LocationName:		MachineManufacturer:	
		MachineModel:	
Occupation:	Grounds Maintenance	HSLAnonymisedToolLetter:	Machine A
Process:	Cutting thick shrub	MachineModifications:	
RecordDate:	October 20, 2010	MachineSize:	600mm blade
		MainID:	1378
		MachineWeight(kg):	5.6
		ResultsID:	9980
TapeNumber:	N/A	MachineOperating pressure:	
Operator#:	OP#2	MachineSpeed(impacts/min):	
	Vertical operation	MachineSpeed(revs/min):	
VideoNumber:	N/A	MachinePower:	
		MachinePower source:	2 stroke oil mix
		MeasurementTime:	59.25 Seconds
Notes:		NumShotsInMeas:	
		InsertedTool:	
		DailyExposureTime:	
DC-shift threshold:	*10 mm*	InsertedToolType:	
		A(8) Front hand	m/s²
		InsertedToolManufacturer:	

	Front hand			Rear hand		
Frequency	x-axis	y-axis	z-axis	x-axis	y-axis	z-axis
1.6	0.234	0.508	0.294	0.505	0.289	0.275
2	0.233	0.538	0.292	0.488	0.304	0.25
2.5	0.293	0.462	0.264	0.435	0.31	0.254
3.15	0.338	0.415	0.248	0.376	0.271	0.348
4	0.434	0.316	0.237	0.276	0.301	0.383
5	0.465	0.279	0.199	0.241	0.298	0.477
6.3	0.418	0.23	0.144	0.21	0.344	0.569
8	0.252	0.238	0.141	0.213	0.531	0.583
10	0.233	0.285	0.215	0.231	0.689	0.646
12.5	0.464	0.338	0.467	0.272	0.743	0.788
16	0.415	0.25	0.437	0.254	0.454	0.487
20	0.25	0.325	0.367	0.392	0.535	0.421
25	0.505	0.797	0.821	1.036	1.228	0.629
31.5	0.347	0.37	0.479	0.376	0.333	0.255
40	0.328	0.338	0.487	0.331	0.322	0.23
50	1.999	1.362	3.265	1.142	1.826	2.137
63	1.161	1.452	1.146	1.259	1.564	1.101
80	1.734	1.27	0.795	1.567	1.46	1.387
100	1.019	0.816	0.382	0.559	0.586	0.667
125	1.033	0.832	0.64	0.614	0.763	0.612
160	4.557	2.168	3.011	2.575	3.514	2.026
200	0.618	1.035	0.591	0.407	0.41	0.366
250	0.473	0.426	0.303	0.451	0.32	0.267
315	0.911	0.691	0.983	1.249	0.537	0.864
400	2.722	3.746	3.611	1.247	0.883	0.911
500	2.564	4.602	3.107	1.68	1.241	0.655
630	4.477	11.16	4.714	3.035	2.28	0.863
800	7.217	11.89	4.701	2.074	1.407	0.77
1000	4.48	8.509	2.888	2.696	1.827	1.981
1250	11.96	16.02	5.15	1.526	1.562	1.998
ahw	**1.333**	**1.195**	**1.52**	**1.1**	**1.7**	**1.6**
av		**2.3**			**2.6**	



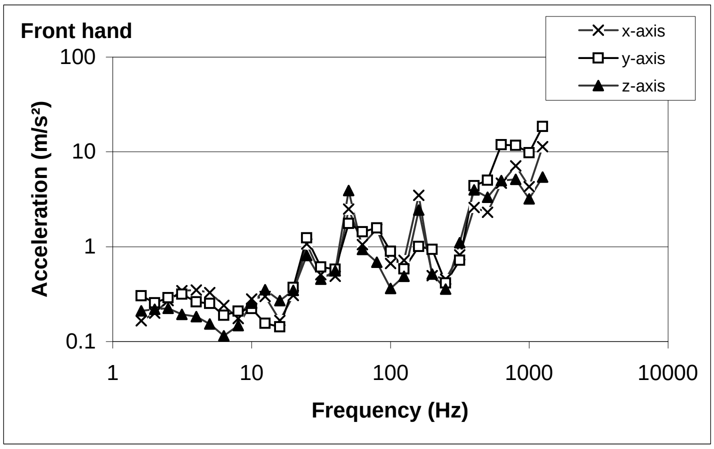


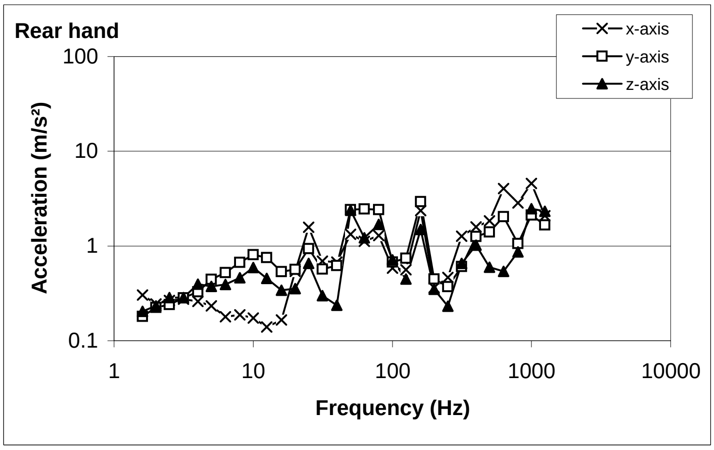


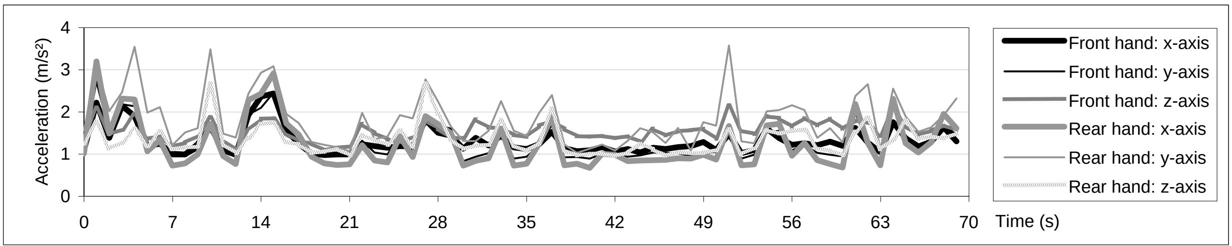
MainID: 1378, ResultsID: 9980

LocationName:	[redacted]	MachineManufacturer:	[redacted]
		MachineModel:	
Occupation:	Grounds Maintenance	HSLAnonymisedToolLetter:	Machine A
Process:	Cutting thick shrub	MachineModifications:	
RecordDate:	October 20, 2010	MachineSize:	600mm blade
		MainID:	1378
		MachineWeight(kg):	5.6
		ResultsID:	9981
TapeNumber:	N/A	MachineOperating pressure:	
Operator#:	OP#3	MachineSpeed(impacts/min):	
	Vertical operation	MachineSpeed(revs/min):	
VideoNumber:	N/A	MachinePower:	
		MachinePower source:	2 stroke oil mix
		MeasurementTime:	70.5 Seconds
Notes:		NumShotsInMeas:	
		InsertedTool:	
		DailyExposureTime:	
DC-shift threshold:	*10 mm*	InsertedToolType:	
		A(8) Front hand	m/s²
		InsertedToolManufacturer:	[redacted]

	Front hand			Rear hand		
Frequency	x-axis	y-axis	z-axis	x-axis	y-axis	z-axis
1.6	0.166	0.305	0.21	0.303	0.181	0.204
2	0.2	0.256	0.219	0.245	0.224	0.234
2.5	0.271	0.289	0.224	0.266	0.241	0.285
3.15	0.345	0.315	0.193	0.275	0.283	0.286
4	0.349	0.263	0.184	0.259	0.329	0.394
5	0.329	0.252	0.153	0.233	0.443	0.376
6.3	0.24	0.189	0.115	0.178	0.524	0.392
8	0.176	0.209	0.147	0.188	0.67	0.464
10	0.282	0.223	0.255	0.173	0.809	0.594
12.5	0.299	0.156	0.352	0.14	0.751	0.457
16	0.168	0.143	0.27	0.166	0.535	0.341
20	0.307	0.372	0.347	0.54	0.565	0.355
25	1.073	1.235	0.807	1.579	0.938	0.654
31.5	0.507	0.61	0.454	0.69	0.571	0.3
40	0.49	0.578	0.557	0.678	0.623	0.238
50	2.5	1.759	3.916	1.328	2.421	2.388
63	1.051	1.439	0.939	1.125	2.457	1.218
80	1.53	1.575	0.685	1.292	2.409	1.688
100	0.667	0.897	0.362	0.584	0.676	0.716
125	0.722	0.584	0.488	0.561	0.745	0.448
160	3.49	1.002	2.435	2.359	2.939	1.49
200	0.497	0.94	0.516	0.364	0.449	0.35
250	0.454	0.414	0.358	0.466	0.373	0.232
315	0.823	0.721	1.102	1.268	0.607	0.656
400	2.586	4.404	3.962	1.59	1.26	1.021
500	2.312	5.026	3.327	1.85	1.402	0.596
630	4.685	11.89	4.967	4.028	2.043	0.538
800	7.135	11.7	5.154	2.858	1.059	0.865
1000	4.299	9.8	3.211	4.564	2.125	2.479
1250	11.39	18.55	5.428	2.087	1.661	2.334
ahw	**1.404**	**1.376**	**1.597**	**1.4**	**2.0**	**1.4**
av		**2.5**			**2.8**	



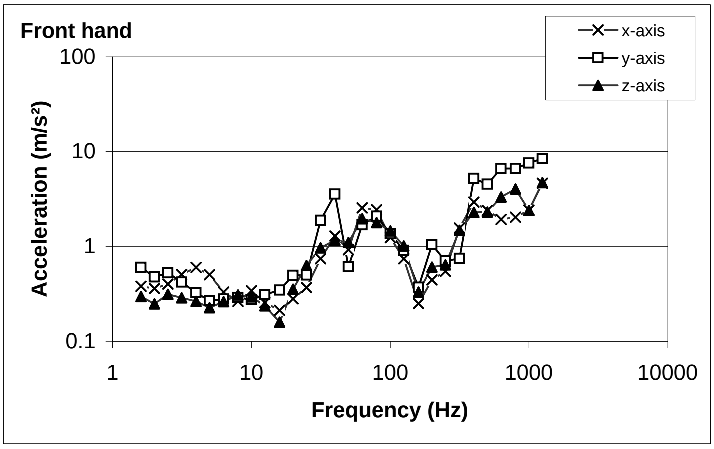


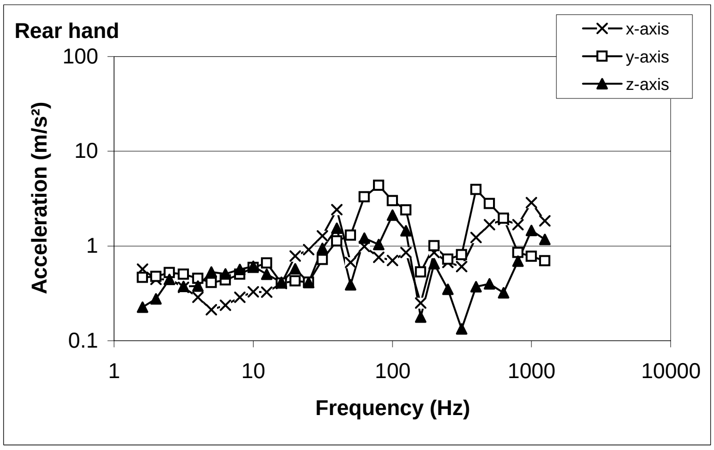


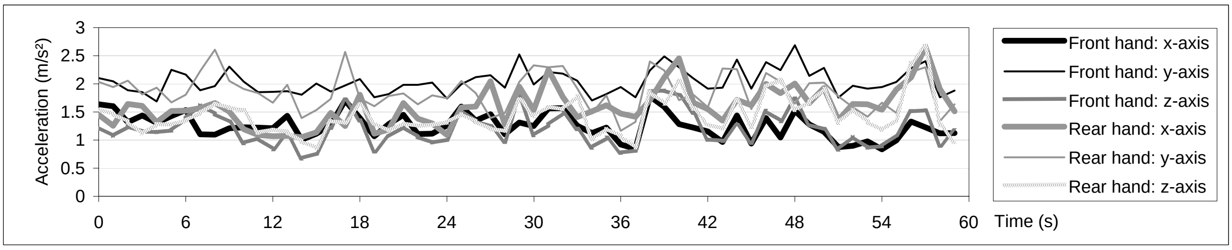
MainID: 1378, ResultsID: 9981

LocationName:	[redacted]	MachineManufacturer: MachineModel:	[redacted]		
				HSLAnonymisedToolLetter:	Machine A
Occupation:	Grounds Maintenance	MachineModifications:			
Process:	Cutting thin shrub	MachineSize:	600mm blade	MainID:	1379
RecordDate:	October 20, 2010	MachineWeight(kg):	5.6	ResultsID:	9982
TapeNumber:	N/A	MachineOperating pressure:			
Operator#:	OP#1 Horizontal operation	MachineSpeed(impacts/min):			
		MachineSpeed(revs/min):			
VideoNumber:	N/A	MachinePower:			
		MachinePower source:	2 stroke oil mix	MeasurementTime:	60.25 Seconds
Notes:				NumShotsInMeas:	
		InsertedTool:		DailyExposureTime:	
DC-shift threshold:	*10 mm*	InsertedToolType:		A(8) Front hand	m/s²
		InsertedToolManufacturer:	[redacted]		

	Front hand			Rear hand		
Frequency	x-axis	y-axis	z-axis	x-axis	y-axis	z-axis
1.6	0.381	0.603	0.296	0.568	0.467	0.225
2	0.359	0.478	0.249	0.444	0.476	0.277
2.5	0.402	0.528	0.313	0.444	0.525	0.443
3.15	0.509	0.419	0.288	0.366	0.504	0.374
4	0.603	0.326	0.263	0.288	0.457	0.378
5	0.503	0.269	0.226	0.213	0.41	0.532
6.3	0.331	0.278	0.262	0.238	0.439	0.506
8	0.263	0.289	0.309	0.287	0.504	0.565
10	0.341	0.274	0.295	0.328	0.591	0.61
12.5	0.256	0.31	0.237	0.327	0.662	0.505
16	0.213	0.346	0.159	0.401	0.404	0.414
20	0.281	0.495	0.354	0.782	0.429	0.572
25	0.369	0.5	0.629	0.917	0.413	0.412
31.5	0.74	1.894	0.969	1.277	0.719	0.945
40	1.293	3.576	1.169	2.411	1.128	1.54
50	0.921	0.609	1.106	0.673	1.297	0.391
63	2.559	1.695	1.956	0.988	3.294	1.211
80	2.441	2.079	1.782	0.758	4.36	1.037
100	1.241	1.365	1.456	0.705	3.008	2.127
125	0.741	0.909	1.013	0.853	2.399	1.444
160	0.251	0.372	0.331	0.25	0.531	0.177
200	0.443	1.045	0.608	0.852	1.002	0.651
250	0.55	0.702	0.639	0.673	0.726	0.349
315	1.564	0.746	1.48	0.607	0.808	0.133
400	2.934	5.233	2.288	1.23	3.94	0.371
500	2.393	4.55	2.311	1.682	2.811	0.399
630	1.936	6.64	3.325	1.898	1.96	0.32
800	2.038	6.663	4.025	1.676	0.856	0.69
1000	2.427	7.603	2.396	2.86	0.776	1.461
1250	4.659	8.442	4.726	1.849	0.695	1.171
ahw	**1.357**	**2.097**	**1.28**	**1.7**	**2.0**	**1.6**
av		**2.8**			**3.0**	



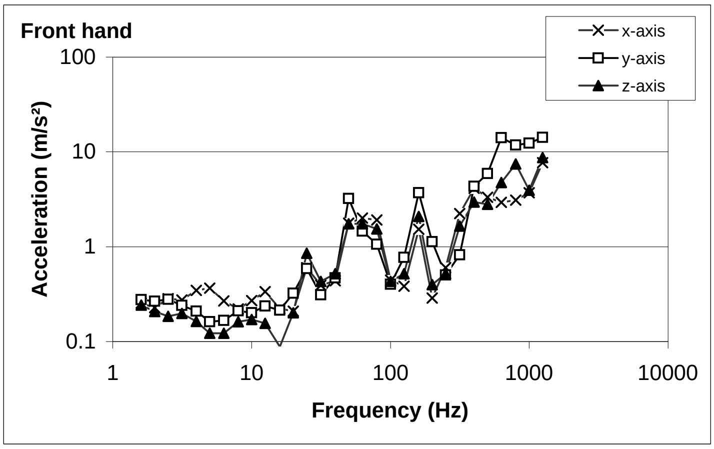


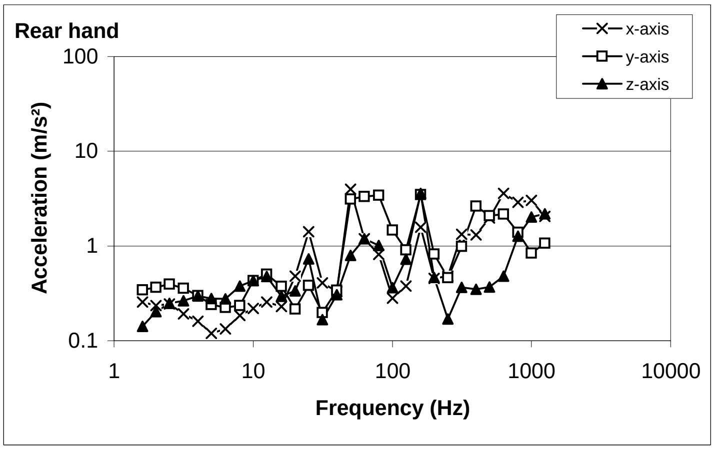


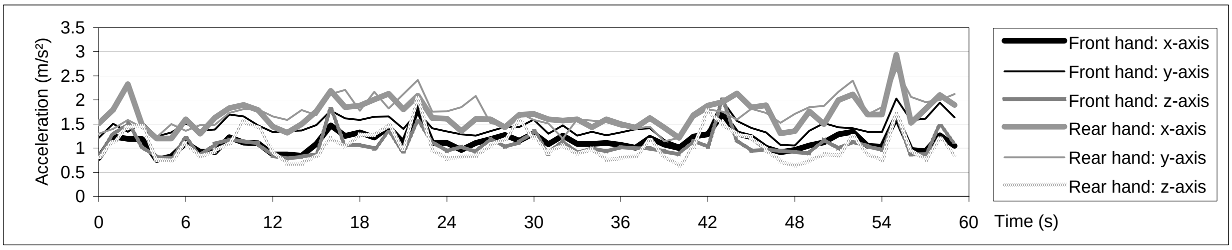
MainID: 1379, ResultsID: 9982

LocationName:	[redacted]	MachineManufacturer: MachineModel:	[redacted]
		HSLAnonymisedToolLetter:	Machine A
Occupation:	Grounds Maintenance	MachineModifications:	
Process:	Cutting thin shrub	MachineSize:	600mm blade
RecordDate:	October 20, 2010	MainID:	1379
		MachineWeight(kg):	5.6
		ResultsID:	9983
TapeNumber:	N/A	MachineOperating pressure:	
Operator#:	OP#2	MachineSpeed(impacts/min):	
	Horizontal operation	MachineSpeed(revs/min):	
VideoNumber:	N/A	MachinePower:	
		MachinePower source:	2 stroke oil mix
		MeasurementTime:	60 Seconds
Notes:		NumShotsInMeas:	
		InsertedTool:	
		DailyExposureTime:	
DC-shift threshold:	*10 mm*	InsertedToolType:	
		A(8) Front hand	m/s²
		InsertedToolManufacturer:	[redacted]

	Front hand			Rear hand		
Frequency	x-axis	y-axis	z-axis	x-axis	y-axis	z-axis
1.6	0.253	0.276	0.243	0.256	0.344	0.142
2	0.229	0.267	0.208	0.234	0.365	0.202
2.5	0.284	0.279	0.185	0.245	0.395	0.249
3.15	0.275	0.24	0.198	0.193	0.356	0.264
4	0.348	0.209	0.163	0.161	0.299	0.297
5	0.365	0.162	0.122	0.12	0.24	0.28
6.3	0.269	0.166	0.122	0.134	0.225	0.277
8	0.221	0.212	0.162	0.185	0.235	0.378
10	0.27	0.201	0.17	0.22	0.431	0.43
12.5	0.335	0.237	0.156	0.257	0.502	0.478
16	0.223	0.214	0.088	0.229	0.375	0.294
20	0.209	0.323	0.201	0.481	0.216	0.336
25	0.601	0.588	0.852	1.416	0.385	0.734
31.5	0.393	0.312	0.433	0.409	0.198	0.166
40	0.439	0.47	0.518	0.332	0.34	0.305
50	1.772	3.223	1.744	3.984	3.125	0.795
63	2.014	1.461	1.748	1.189	3.334	1.19
80	1.912	1.059	1.541	0.817	3.428	1.012
100	0.445	0.403	0.43	0.282	1.474	0.362
125	0.383	0.769	0.521	0.378	0.91	0.726
160	1.525	3.713	2.089	1.581	3.481	3.586
200	0.287	1.132	0.4	0.453	0.822	0.464
250	0.604	0.503	0.518	0.482	0.461	0.17
315	2.235	0.818	1.654	1.327	0.987	0.365
400	4.126	4.336	2.971	1.307	2.644	0.35
500	3.316	5.925	2.798	1.971	2.08	0.368
630	2.936	14.08	4.745	3.585	2.171	0.481
800	3.097	11.84	7.442	2.897	1.397	1.272
1000	3.722	12.38	3.942	3.037	0.839	2.03
1250	7.723	14.22	8.746	2.057	1.066	2.192
ahw	**1.202**	**1.478**	**1.124**	**1.8**	**1.8**	**1.1**
av		**2.2**			**2.8**	



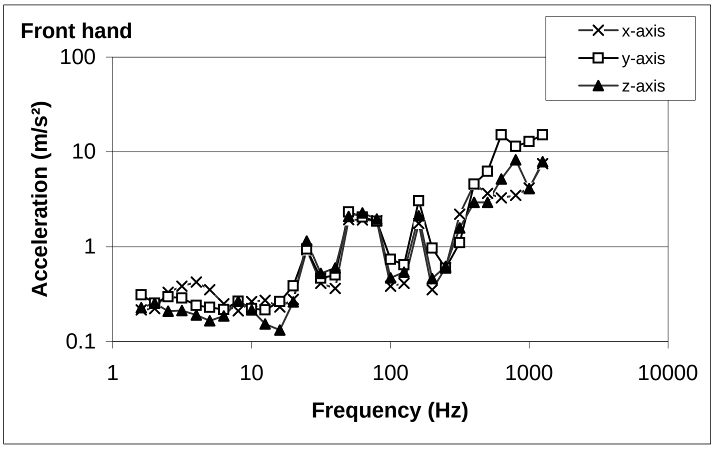


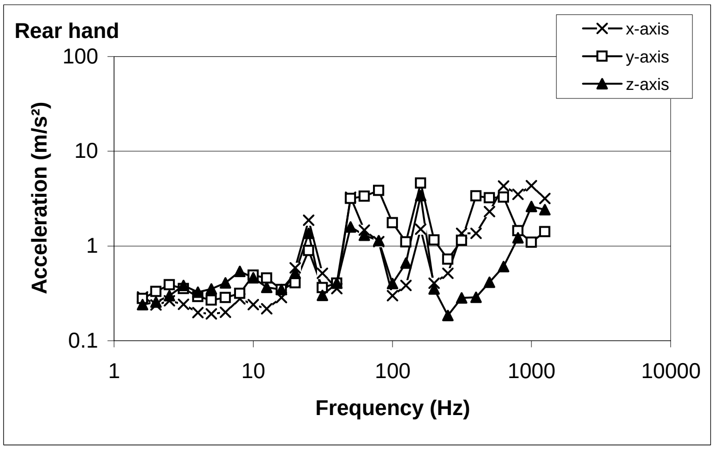


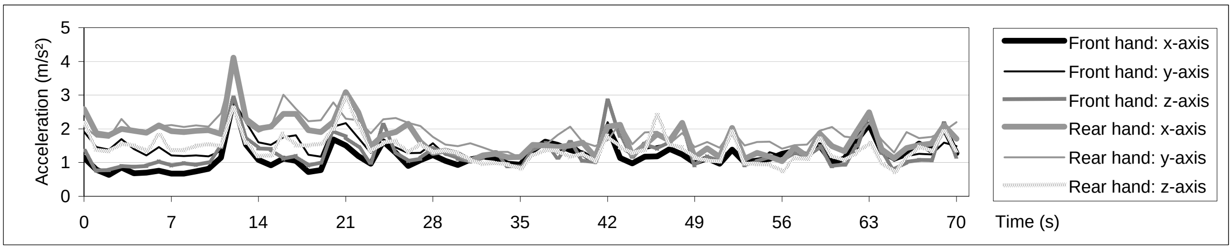
MainID: 1379, ResultsID: 9983

LocationName:		MachineManufacturer:			
		MachineModel:			
Occupation:	Grounds Maintenance			HSLAnonymisedToolLetter:	Machine A
Process:	Cutting thin shrub	MachineModifications:			
RecordDate:	October 20, 2010	MachineSize:	600mm blade	MainID:	1379
		MachineWeight(kg):	5.6	ResultsID:	9984
TapeNumber:	N/A	MachineOperating pressure:			
Operator#:	OP#3	MachineSpeed(impacts/min):			
	Horizontal operation	MachineSpeed(revs/min):			
VideoNumber:	N/A	MachinePower:			
		MachinePower source:	2 stroke oil mix	MeasurementTime:	71.5 Seconds
Notes:				NumShotsInMeas:	
		InsertedTool:		DailyExposureTime:	
DC-shift threshold:	*10 mm*	InsertedToolType:		A(8) Front hand	m/s²
		InsertedToolManufacturer:			

	Front hand			Rear hand		
Frequency	x-axis	y-axis	z-axis	x-axis	y-axis	z-axis
1.6	0.216	0.312	0.229	0.291	0.28	0.24
2	0.222	0.254	0.254	0.238	0.33	0.256
2.5	0.332	0.297	0.209	0.264	0.391	0.298
3.15	0.383	0.287	0.213	0.243	0.355	0.385
4	0.424	0.24	0.19	0.199	0.292	0.325
5	0.351	0.229	0.166	0.192	0.268	0.352
6.3	0.25	0.218	0.186	0.199	0.285	0.408
8	0.21	0.266	0.267	0.277	0.316	0.541
10	0.264	0.223	0.216	0.241	0.492	0.462
12.5	0.273	0.216	0.153	0.218	0.46	0.365
16	0.231	0.263	0.133	0.286	0.346	0.346
20	0.279	0.386	0.262	0.589	0.407	0.514
25	0.932	0.945	1.144	1.878	0.895	1.363
31.5	0.412	0.466	0.524	0.515	0.363	0.301
40	0.363	0.504	0.595	0.356	0.405	0.405
50	1.923	2.319	2.087	3.279	3.169	1.594
63	1.916	2.05	2.265	1.472	3.34	1.298
80	1.892	1.856	1.959	1.109	3.853	1.138
100	0.383	0.734	0.47	0.298	1.757	0.402
125	0.413	0.647	0.539	0.383	1.103	0.659
160	1.766	3.05	2.113	1.503	4.623	3.407
200	0.351	0.965	0.463	0.406	1.152	0.352
250	0.603	0.594	0.62	0.515	0.727	0.184
315	2.199	1.101	1.575	1.365	1.151	0.283
400	4.579	4.566	2.933	1.365	3.367	0.287
500	3.663	6.217	2.937	2.311	3.218	0.416
630	3.266	15.17	5.176	4.283	3.269	0.608
800	3.477	11.47	8.239	3.522	1.443	1.218
1000	4.163	12.85	4.113	4.32	1.091	2.617
1250	7.532	15.18	7.883	3.178	1.418	2.41
ahw	**1.299**	**1.494**	**1.407**	**1.9**	**2.0**	**1.5**
av		**2.4**			**3.1**	







MainID: 1379, ResultsID: 9984

LocationName:

Occupation: Grounds Maintenance
Process: Cutting conifer
RecordDate: October 20, 2010

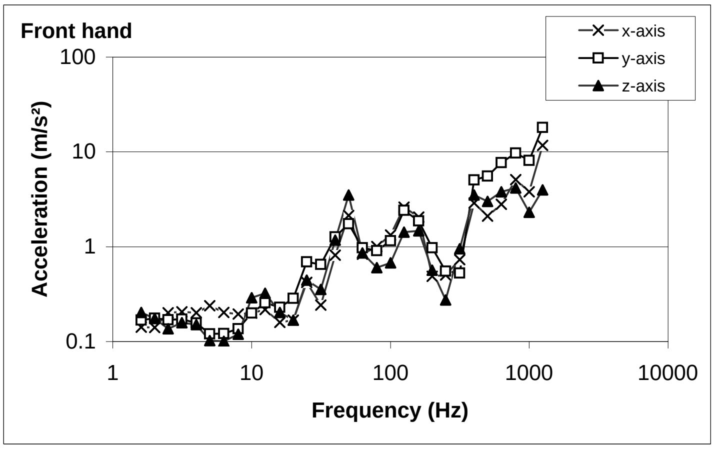
TapeNumber: N/A
Operator#: OP#1
Vertical operation
VideoNumber: N/A

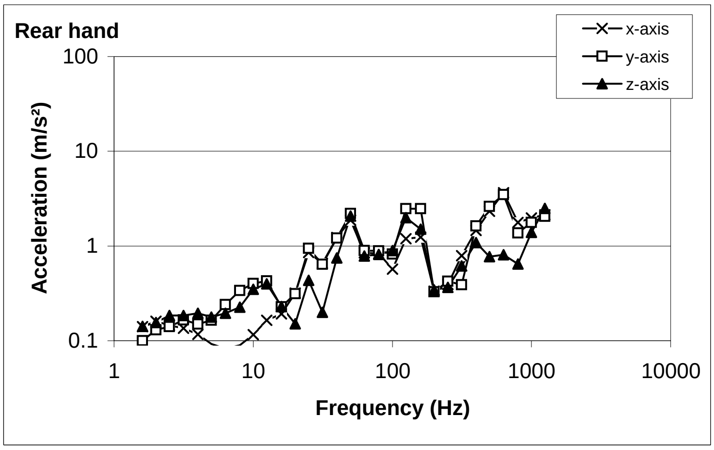
Notes:

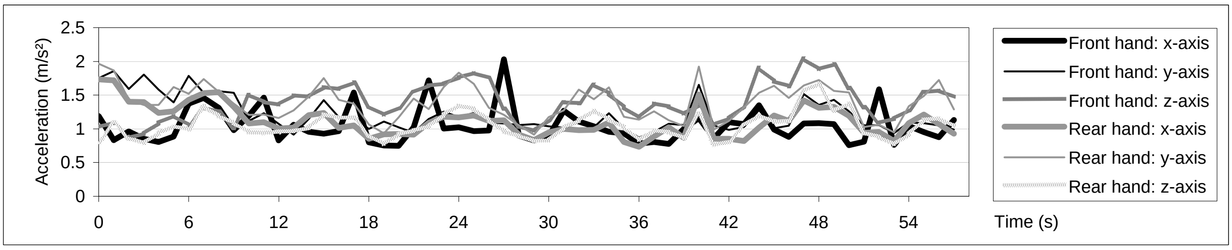
DC-shift threshold: 10 mm

MachineManufacturer:
MachineModel:
HSLAnonymisedToolLetter: Machine A
MachineModifications:
MachineSize: 600mm blade
MainID: 1380
MachineWeight(kg): 5.6
ResultsID: 9985
MachineOperating pressure:
MachineSpeed(impacts/min):
MachineSpeed(revs/min):
MachinePower:
MachinePower source: 2 stroke oil mix
MeasurementTime: 58 Seconds
NumShotsInMeas:
InsertedTool:
DailyExposureTime:
InsertedToolType:
A(8) Front hand m/s²
InsertedToolManufacturer:

	Front hand			Rear hand		
Frequency	x-axis	y-axis	z-axis	x-axis	y-axis	z-axis
1.6	0.141	0.168	0.203	0.141	0.1	0.142
2	0.141	0.177	0.174	0.16	0.13	0.155
2.5	0.201	0.169	0.137	0.146	0.14	0.185
3.15	0.206	0.172	0.159	0.135	0.165	0.185
4	0.202	0.157	0.151	0.116	0.15	0.194
5	0.239	0.121	0.102	0.093	0.165	0.178
6.3	0.203	0.122	0.101	0.083	0.24	0.195
8	0.195	0.136	0.12	0.09	0.34	0.225
10	0.2	0.2	0.289	0.116	0.401	0.351
12.5	0.218	0.257	0.322	0.164	0.429	0.399
16	0.16	0.23	0.203	0.193	0.229	0.23
20	0.168	0.286	0.168	0.318	0.313	0.151
25	0.421	0.693	0.445	0.855	0.946	0.435
31.5	0.242	0.652	0.356	0.653	0.639	0.199
40	0.817	1.267	1.174	1.227	1.208	0.746
50	2.129	1.741	3.521	1.869	2.209	2.071
63	0.837	0.974	0.859	0.847	0.892	0.784
80	1.003	0.91	0.602	0.832	0.89	0.817
100	1.326	1.152	0.675	0.571	0.819	0.894
125	2.621	2.417	1.431	1.192	2.471	1.986
160	2.056	1.866	1.466	1.24	2.477	1.509
200	0.489	0.976	0.567	0.333	0.328	0.343
250	0.503	0.552	0.274	0.391	0.424	0.365
315	0.73	0.525	0.956	0.789	0.39	0.617
400	2.885	5.062	3.506	1.456	1.633	1.09
500	2.105	5.553	3.004	2.331	2.61	0.773
630	2.801	7.696	3.806	3.663	3.496	0.808
800	5.088	9.757	4.18	1.767	1.372	0.646
1000	3.794	8.134	2.305	1.977	1.779	1.393
1250	11.69	18.16	3.971	2.138	2.048	2.493
ahw	**1.1**	**1.254**	**1.442**	**1.2**	**1.4**	**1.1**
av		**2.2**			**2.1**	







MainID: 1380, ResultsID: 9985

LocationName: [redacted]

Occupation: Grounds Maintenance
Process: Cutting conifer
RecordDate: October 20, 2010

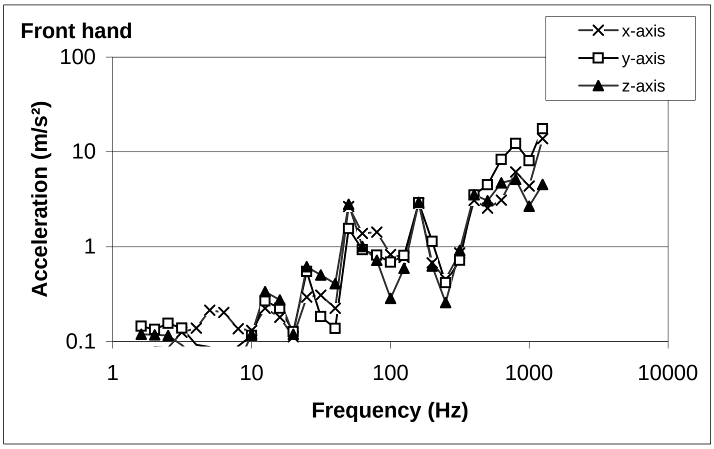
TapeNumber: N/A
Operator#: OP#2
Vertical operation
VideoNumber: N/A

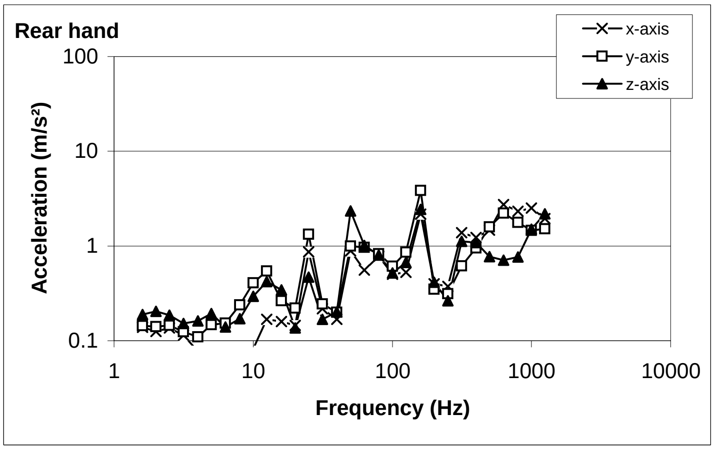
Notes:

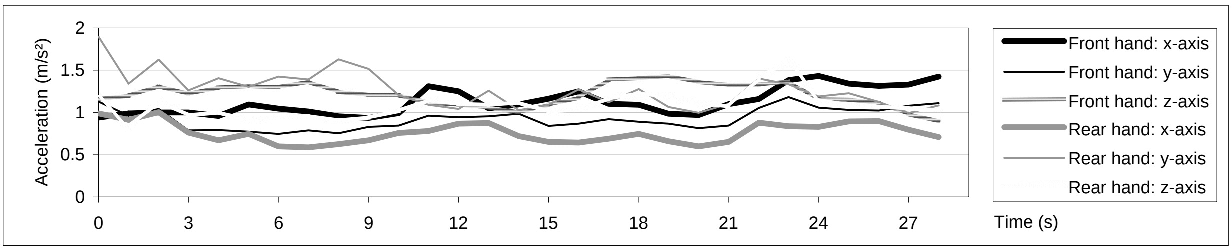
DC-shift threshold: 10 mm

MachineManufacturer: [redacted]
MachineModel:
HSLAnonymisedToolLetter: Machine A
MachineModifications:
MachineSize: 600mm blade
MainID: 1380
MachineWeight(kg): 5.6
ResultsID: 9986
MachineOperating pressure:
MachineSpeed(impacts/min):
MachineSpeed(revs/min):
MachinePower:
MachinePower source: 2 stroke oil mix
MeasurementTime: 29.5 Seconds
NumShotsInMeas:
InsertedTool:
DailyExposureTime:
InsertedToolType:
A(8) Front hand m/s²
InsertedToolManufacturer: [redacted]

	Front hand			Rear hand		
Frequency	x-axis	y-axis	z-axis	x-axis	y-axis	z-axis
1.6	0.079	0.145	0.119	0.139	0.144	0.189
2	0.088	0.135	0.118	0.125	0.141	0.205
2.5	0.086	0.156	0.116	0.136	0.146	0.186
3.15	0.125	0.138	0.092	0.114	0.124	0.152
4	0.138	0.092	0.067	0.077	0.109	0.162
5	0.214	0.087	0.08	0.069	0.148	0.193
6.3	0.203	0.06	0.064	0.049	0.153	0.139
8	0.137	0.089	0.059	0.062	0.239	0.171
10	0.131	0.116	0.12	0.082	0.409	0.294
12.5	0.225	0.268	0.337	0.168	0.544	0.422
16	0.181	0.224	0.274	0.159	0.265	0.343
20	0.112	0.127	0.12	0.145	0.22	0.137
25	0.294	0.548	0.615	0.868	1.334	0.468
31.5	0.308	0.184	0.505	0.217	0.244	0.168
40	0.224	0.138	0.408	0.168	0.2	0.202
50	2.665	1.552	2.811	0.889	0.996	2.352
63	1.384	0.93	1.007	0.555	0.97	1.013
80	1.421	0.814	0.719	0.779	0.827	0.803
100	0.83	0.687	0.286	0.505	0.612	0.521
125	0.772	0.809	0.591	0.527	0.861	0.672
160	2.868	2.911	2.932	2.169	3.841	2.431
200	0.679	1.138	0.625	0.399	0.35	0.414
250	0.454	0.417	0.258	0.374	0.313	0.265
315	0.862	0.719	0.912	1.38	0.614	1.119
400	3.075	3.512	3.547	1.231	0.954	1.084
500	2.56	4.505	3.058	1.471	1.589	0.77
630	3.098	8.34	4.709	2.742	2.215	0.711
800	6.142	12.27	5.125	2.321	1.769	0.768
1000	4.376	8.04	2.67	2.513	1.459	1.505
1250	13.78	17.48	4.55	1.951	1.517	2.182
ahw	**1.162**	**0.951**	**1.234**	**0.8**	**1.3**	**1.1**
av		**1.9**			**1.9**	



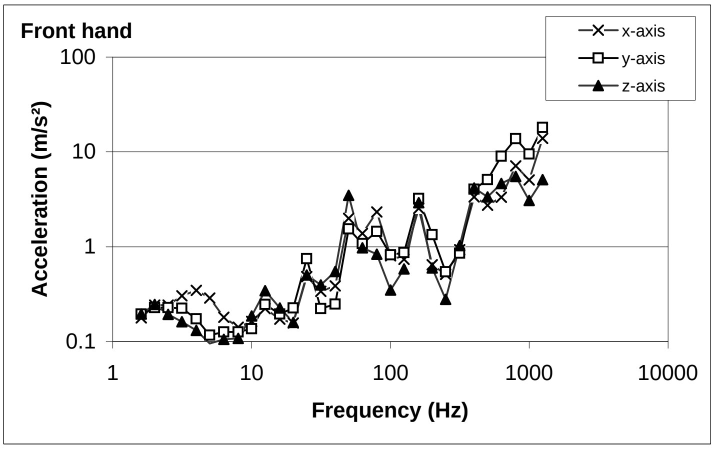


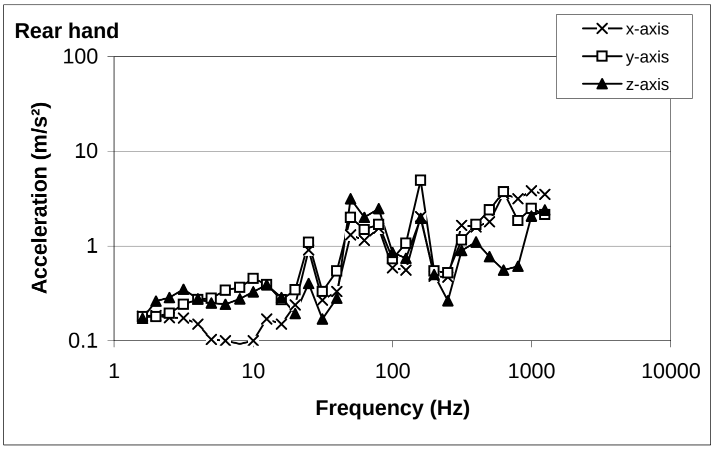


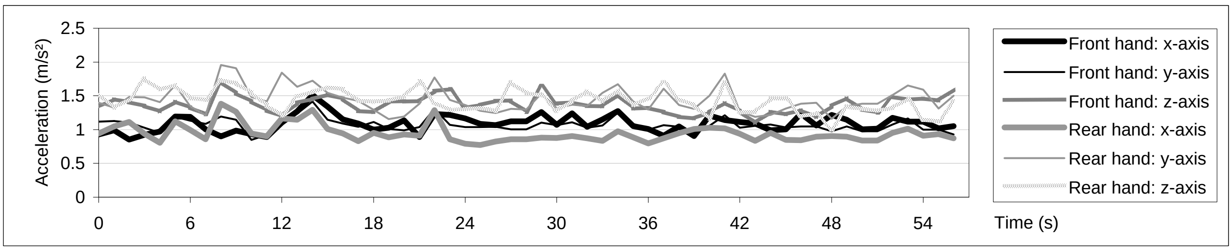
MainID: 1380, ResultsID: 9986

LocationName:		MachineManufacturer:			
		MachineModel:			
Occupation:	Grounds Maintenance			HSLAnonymisedToolLetter:	Machine A
Process:	Cutting conifer	MachineModifications:			
RecordDate:	October 20, 2010	MachineSize:	600mm blade	MainID:	1380
		MachineWeight(kg):	5.6	ResultsID:	9987
TapeNumber:	N/A	MachineOperating pressure:			
Operator#:	OP#3	MachineSpeed(impacts/min):			
	Vertical operation	MachineSpeed(revs/min):			
VideoNumber:	N/A	MachinePower:			
		MachinePower source:	2 stroke oil mix	MeasurementTime:	57 Seconds
Notes:				NumShotsInMeas:	
		InsertedTool:		DailyExposureTime:	
DC-shift threshold:	*10 mm*	InsertedToolType:		A(8) Front hand	m/s²
		InsertedToolManufacturer:			

	Front hand			Rear hand		
Frequency	x-axis	y-axis	z-axis	x-axis	y-axis	z-axis
1.6	0.178	0.194	0.195	0.182	0.179	0.172
2	0.243	0.228	0.246	0.185	0.179	0.261
2.5	0.242	0.228	0.193	0.176	0.195	0.286
3.15	0.303	0.224	0.162	0.173	0.242	0.35
4	0.347	0.173	0.131	0.149	0.272	0.277
5	0.288	0.117	0.095	0.103	0.281	0.25
6.3	0.181	0.126	0.105	0.1	0.341	0.243
8	0.142	0.126	0.108	0.093	0.365	0.277
10	0.163	0.136	0.186	0.1	0.454	0.329
12.5	0.222	0.246	0.345	0.169	0.394	0.391
16	0.173	0.194	0.227	0.15	0.269	0.286
20	0.156	0.226	0.159	0.239	0.344	0.194
25	0.483	0.75	0.505	0.912	1.091	0.401
31.5	0.338	0.223	0.395	0.269	0.331	0.17
40	0.387	0.248	0.549	0.331	0.545	0.28
50	1.998	1.536	3.475	1.308	2.013	3.152
63	1.38	1.079	0.971	1.151	1.495	2.002
80	2.32	1.446	0.836	1.541	1.691	2.468
100	0.803	0.82	0.35	0.588	0.73	0.856
125	0.734	0.865	0.584	0.558	1.072	0.742
160	2.527	3.233	2.913	2.043	4.937	1.961
200	0.644	1.343	0.597	0.482	0.546	0.501
250	0.511	0.544	0.278	0.468	0.519	0.265
315	0.927	0.856	1.025	1.653	1.154	0.893
400	3.358	4.04	4.165	1.588	1.692	1.104
500	2.737	5.112	3.34	1.8	2.409	0.77
630	3.327	8.993	4.656	3.569	3.73	0.555
800	7.101	13.79	5.503	3.156	1.86	0.609
1000	5.064	9.53	3.072	3.826	2.491	2.074
1250	13.92	18.08	5.107	3.499	2.147	2.394
ahw	**1.129**	**1.093**	**1.395**	**1.0**	**1.5**	**1.5**
av		**2.1**			**2.3**	







MainID: 1380, ResultsID: 9987

Vibration Emission Test report - Full

Standard: BS EN ISO 10517:2009
N&V reference ID: Machine B Idling
Measurement File name:

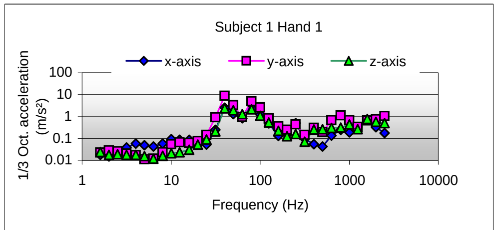
					Hand Position 1 - Support							Hand Position 2 - Throttle						
									Operator Statistics							Operator Statistics		
TestNo.	Operator	Meas. Name	Meas. Date	Meas Time	a_{whx}	a_{why}	a_{whz}	a_{hv}	Mean a_{hv}	S_{n-1}	C_v	a_{whx}	a_{why}	a_{whz}	a_{hv}	Mean a_{hv}	S_{n-1}	C_v
1	1	dle RH0	3/06/201	11:02:09:999	1.66	4.23	1.57	4.81				2.30	4.46	3.15	5.92			
2	1	dle RH0	3/06/201	11:03:01:623	1.47	4.65	1.30	5.05				2.55	4.56	3.47	6.27			
3	1	dle RH0	3/06/201	11:03:52:748	1.30	4.00	1.26	4.39	4.48	0.445	0.099	2.27	4.50	3.03	5.88	5.78	0.385	0.067
4	1	dle RH0	3/06/201	11:04:42:874	1.38	3.72	1.26	4.16				2.37	4.21	2.78	5.58			
5	1	dle RH0	3/06/201	11:05:33:248	1.15	3.62	1.18	3.98				2.54	3.84	2.52	5.25			
6	2	dle SH0	3/06/201	11:09:44:249	2.19	4.09	2.57	5.30				1.17	4.55	2.41	5.27			
7	2	dle SH0	3/06/201	11:10:35:373	2.13	4.18	2.11	5.15				1.53	4.84	2.52	5.67			
8	2	dle SH0	3/06/201	11:11:26:623	2.20	4.27	2.16	5.26	5.30	0.149	0.028	0.93	4.79	2.42	5.45	5.59	0.301	0.054
9	2	dle SH0	3/06/201	11:12:19:248	2.06	4.38	1.98	5.23				0.93	4.73	2.67	5.51			
10	2	dle SH0	3/06/201	11:13:11:373	2.13	4.79	1.82	5.55				1.03	5.19	2.98	6.07			
11	3	dle MM0	3/06/201	11:16:53:374	2.50	3.31	1.94	4.58				2.15	4.44	3.64	6.13			
12	3	dle MM0	3/06/201	11:17:45:248	2.94	3.01	2.10	4.70				1.75	4.32	3.64	5.91			
13	3	dle MM0	3/06/201	11:18:40:624	2.82	2.89	1.94	4.48	4.52	0.204	0.045	1.71	4.17	3.47	5.69	6.15	0.653	0.106
14	3	dle MM0	3/06/201	11:19:34:249	2.71	2.72	1.66	4.18				2.04	4.00	3.57	5.74			
15	3	dle MM0	3/06/201	11:20:27:249	2.58	3.59	1.43	4.65				4.08	4.48	4.03	7.28			

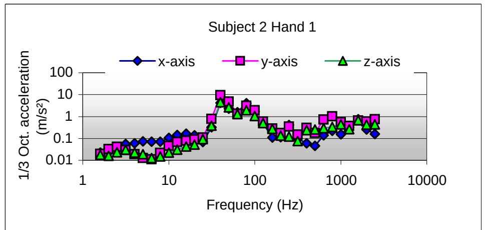
	Hand Position 1 - Support			Hand Position 2 - Throttle		
a_h (overall mean a_{hv}):	4.76	m/s²		5.84	m/s²
$\sigma_{R(single\ m/c.)}$:	0.55	m/s²		0.67	m/s²
$K_{(single\ m/c.)}$ value:	0.90	m/s²		1.10	m/s²

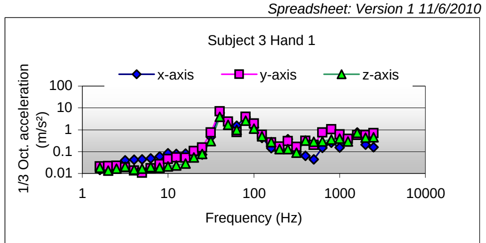
Single machine declared emission a_{hd} (= greatest a_h value): 5.84 m/s² **$K_{(single\ m/c.)}$ value: 1.10 m/s²**

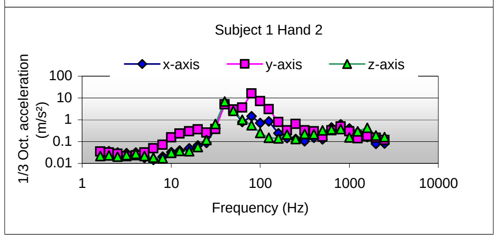
Pulse file version: Hedge trimmer emission - Dual triggered averaging time V1.0 2010-06-11.pls

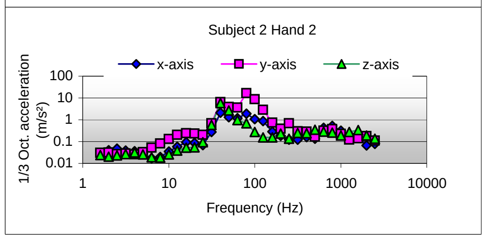
Spreadsheet: Version 1 11/6/2010

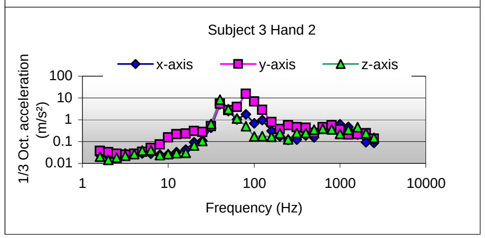












Vibration Emission Test report - Full

Standard: BS EN ISO 10517:2009
N&V reference ID: Machine B Racing
Measurement File name:

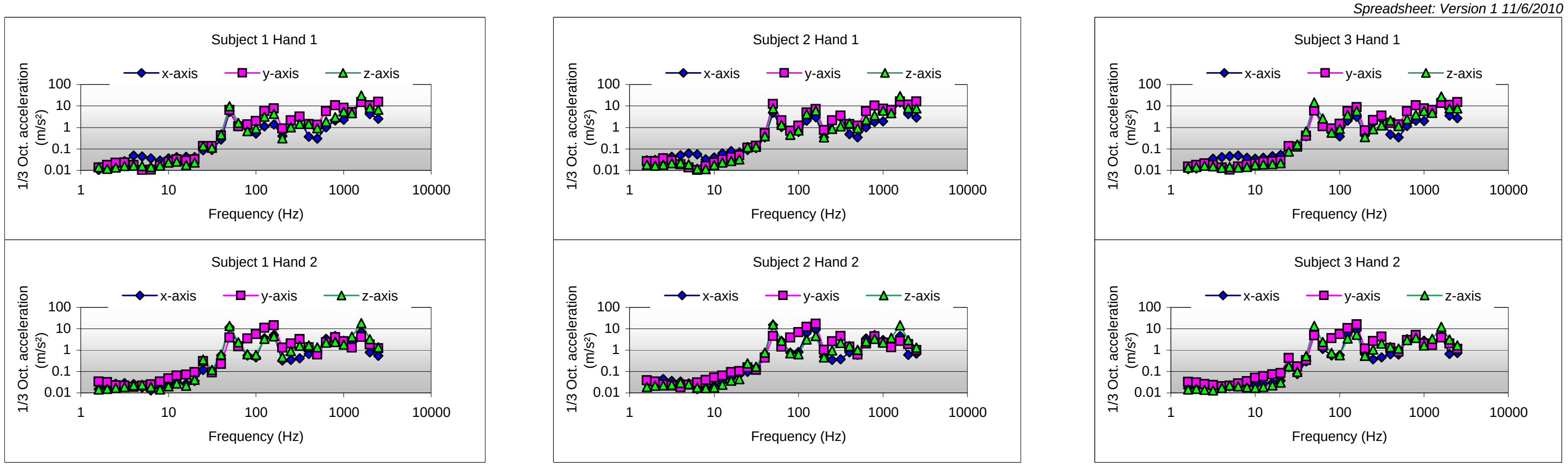
					Hand Position 1 - Support							Hand Position 2 - Throttle						
									Operator Statistics							Operator Statistics		
TestNo.	Operator	Meas. Name	Meas. Date	Meas Time	a_{whx}	a_{why}	a_{whz}	a_{hv}	Mean a_{hv}	S_{n-1}	C_v	a_{whx}	a_{why}	a_{whz}	a_{hv}	Mean a_{hv}	S_{n-1}	C_v
1	1	cing RH	3/06/201	11:02:36:123	1.98	2.75	3.43	4.82	4.50	0.233	0.052	3.98	2.79	4.45	6.58	6.58	0.130	0.020
2	1	cing RH	3/06/201	11:03:25:623	1.75	2.69	3.35	4.64				3.79	2.62	4.41	6.38			
3	1	cing RH	3/06/201	11:04:17:123	1.77	2.40	3.26	4.42				3.86	2.70	4.56	6.55			
4	1	cing RH	3/06/201	11:05:07:498	1.71	2.23	3.18	4.24				3.89	2.73	4.65	6.65			
5	1	cing RH	3/06/201	11:05:56:998	1.75	2.13	3.37	4.36				3.94	2.70	4.74	6.73			
6	2	cing SH	3/06/201	11:10:08:873	1.68	4.08	2.50	5.07	5.20	0.077	0.015	4.87	3.43	5.61	8.18	7.94	0.259	0.033
7	2	cing SH	3/06/201	11:11:00:249	1.39	4.21	2.73	5.21				5.30	2.95	5.36	8.09			
8	2	cing SH	3/06/201	11:11:52:123	1.57	4.25	2.69	5.27				5.22	3.03	5.22	7.98			
9	2	cing SH	3/06/201	11:12:44:248	1.74	4.24	2.54	5.24				5.15	3.17	5.10	7.92			
10	2	cing SH	3/06/201	11:13:35:999	2.03	3.97	2.71	5.22				4.78	3.15	4.87	7.51			
11	3	cing MM	3/06/201	11:17:18:748	2.47	2.19	5.18	6.15	6.02	0.342	0.057	2.39	3.20	5.13	6.50	5.85	0.556	0.095
12	3	cing MM	3/06/201	11:18:13:873	2.50	1.99	4.90	5.85				2.46	3.23	4.82	6.30			
13	3	cing MM	3/06/201	11:19:06:373	2.60	2.25	4.58	5.73				2.33	3.04	4.41	5.84			
14	3	cing MM	3/06/201	11:19:59:498	2.72	2.24	4.61	5.80				1.91	2.82	4.12	5.35			
15	3	cing MM	3/06/201	11:20:52:249	2.72	3.09	5.10	6.56				2.37	2.63	3.87	5.25			

	Hand Position 1 - Support		Hand Position 2 - Throttle	
a_h (overall mean a_{hv}):	5.24	m/s²	6.79	m/s²
$\sigma_{R(single\ m/c.)}$:	0.71	m/s²	1.01	m/s²
$K_{(single\ m/c.)}$ value:	1.18	m/s²	1.66	m/s²

Single machine declared emission a_{hd} (= greatest a_h value): 6.79 m/s² **$K_{(single\ m/c.)}$ value: 1.66 m/s²**

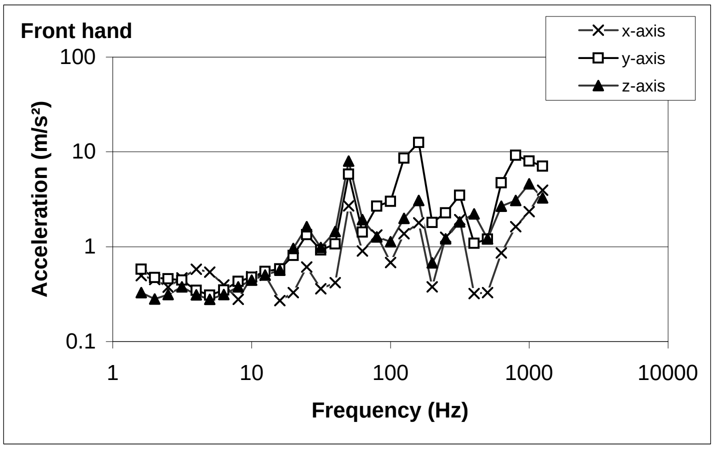
Pulse file version: Hedge trimmer emission - Dual triggered averaging time V1.0 2010-06-11.pls

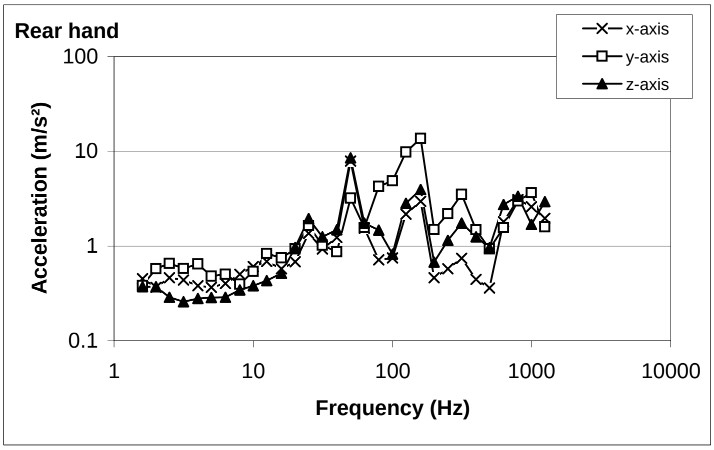
Spreadsheet: Version 1 11/6/2010

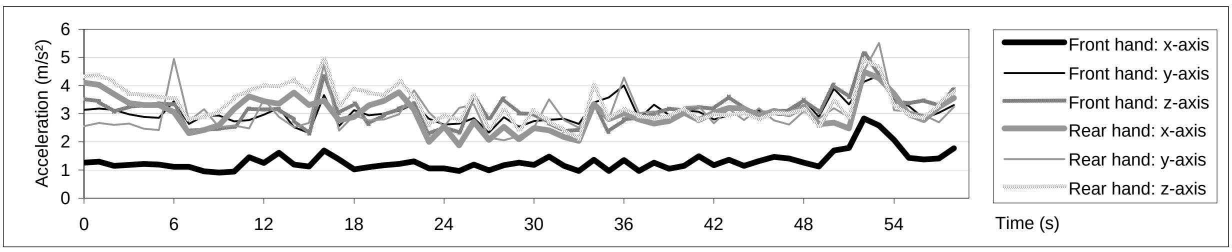


LocationName:		MachineManufacturer:	
		MachineModel:	
Occupation:	Grounds Maintenance	HSLAnonymisedToolLetter:	Machine B
Process:	Cutting thick shrub	MachineModifications:	
RecordDate:	October 20, 2010	MachineSize:	600mm blade
		MainID:	1381
		MachineWeight(kg):	5.7
		ResultsID:	9988
TapeNumber:	N/A	MachineOperating pressure:	
Operator#:	OP#1	MachineSpeed(impacts/min):	
	Horizontal operation	MachineSpeed(revs/min):	
VideoNumber:	N/A	MachinePower:	
		MachinePower source:	2 stroke oil mix
		MeasurementTime:	59 Seconds
Notes:		NumShotsInMeas:	
		InsertedTool:	
		DailyExposureTime:	
DC-shift threshold:	*10 mm*	InsertedToolType:	
		A(8) Front hand	m/s²
		InsertedToolManufacturer:	

	Front hand			Rear hand		
Frequency	x-axis	y-axis	z-axis	x-axis	y-axis	z-axis
1.6	0.497	0.58	0.329	0.453	0.382	0.371
2	0.452	0.474	0.281	0.365	0.576	0.373
2.5	0.375	0.458	0.314	0.461	0.655	0.289
3.15	0.469	0.444	0.377	0.439	0.581	0.258
4	0.579	0.348	0.312	0.382	0.647	0.279
5	0.539	0.309	0.279	0.365	0.482	0.286
6.3	0.395	0.349	0.314	0.402	0.503	0.289
8	0.279	0.429	0.376	0.504	0.396	0.345
10	0.484	0.477	0.445	0.607	0.54	0.381
12.5	0.501	0.549	0.505	0.688	0.834	0.429
16	0.27	0.583	0.564	0.574	0.746	0.515
20	0.33	0.811	0.957	0.684	0.93	0.967
25	0.611	1.344	1.632	1.356	1.639	1.942
31.5	0.36	0.921	0.983	0.933	1.021	1.246
40	0.418	1.071	1.449	1.234	0.87	1.485
50	2.699	5.834	8.022	7.864	3.195	8.535
63	0.899	1.423	1.936	1.539	1.562	1.747
80	1.326	2.683	1.268	0.713	4.267	1.471
100	0.683	3.005	1.128	0.746	4.85	0.822
125	1.369	8.601	1.994	2.168	9.795	2.828
160	1.793	12.56	3.085	2.964	13.67	3.935
200	0.377	1.805	0.676	0.463	1.489	0.677
250	1.255	2.272	1.214	0.573	2.184	1.151
315	1.931	3.486	1.833	0.74	3.5	1.743
400	0.32	1.082	2.212	0.444	1.488	1.25
500	0.327	1.199	1.214	0.361	0.93	0.959
630	0.86	4.708	2.683	1.798	1.565	2.735
800	1.629	9.201	3.083	3.101	2.984	3.35
1000	2.34	8.03	4.625	2.594	3.637	1.695
1250	3.956	7.053	3.275	1.963	1.588	2.943
ahw	**1.439**	**3.126**	**3.238**	**3.1**	**3.2**	**3.5**
av		**4.7**			**5.6**	



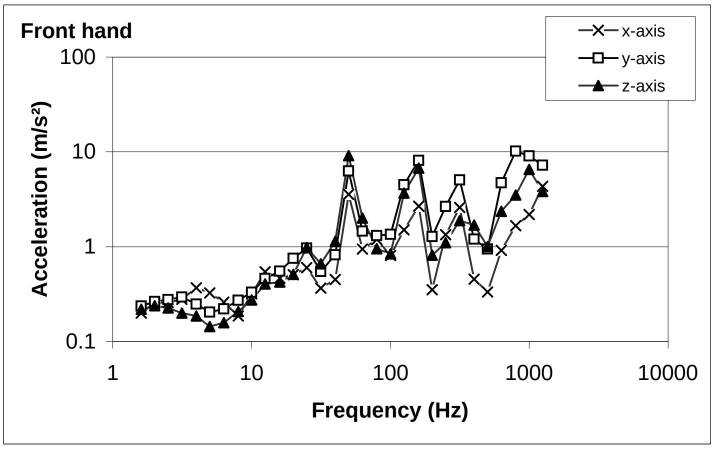


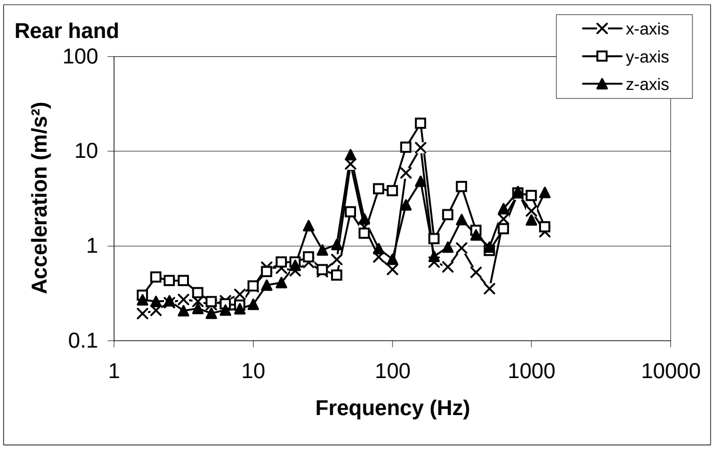


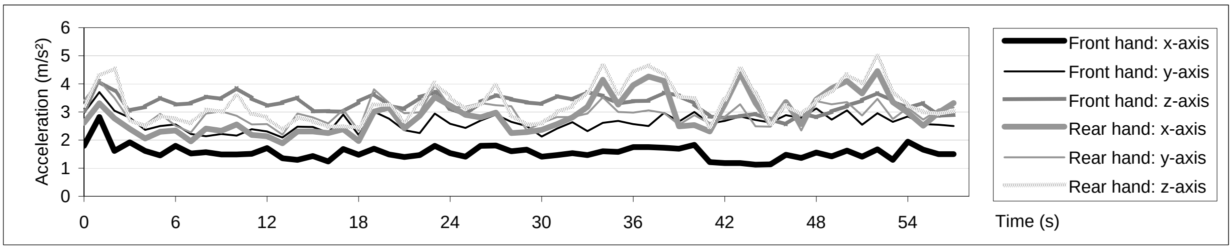
MainID: 1381, ResultsID: 9988

LocationName:		MachineManufacturer:	
		MachineModel:	
Occupation:	Grounds Maintenance	HSLAnonymisedToolLetter:	Machine B
Process:	Cutting thick shrub	MachineModifications:	
RecordDate:	October 20, 2010	MachineSize:	600mm blade
		MachineWeight(kg):	5.7
		MainID:	1381
		ResultsID:	9989
TapeNumber:	N/A	MachineOperating pressure:	
Operator#:	OP#2	MachineSpeed(impacts/min):	
	Horizontal operation	MachineSpeed(revs/min):	
VideoNumber:	N/A	MachinePower:	
		MachinePower source:	2 stroke oil mix
		MeasurementTime:	58.5 Seconds
Notes:		NumShotsInMeas:	
		InsertedTool:	
		DailyExposureTime:	
DC-shift threshold:	*10 mm*	InsertedToolType:	
		A(8) Front hand	m/s²
		InsertedToolManufacturer:	

	Front hand			Rear hand		
Frequency	x-axis	y-axis	z-axis	x-axis	y-axis	z-axis
1.6	0.2	0.238	0.22	0.194	0.301	0.27
2	0.254	0.264	0.238	0.209	0.47	0.261
2.5	0.258	0.278	0.226	0.252	0.43	0.265
3.15	0.279	0.295	0.2	0.272	0.431	0.207
4	0.369	0.248	0.186	0.26	0.32	0.219
5	0.326	0.205	0.144	0.241	0.258	0.195
6.3	0.261	0.221	0.158	0.265	0.244	0.21
8	0.186	0.273	0.208	0.308	0.237	0.218
10	0.318	0.332	0.274	0.372	0.377	0.243
12.5	0.543	0.462	0.404	0.597	0.537	0.387
16	0.465	0.551	0.423	0.584	0.679	0.412
20	0.507	0.752	0.51	0.547	0.674	0.623
25	0.602	0.965	0.982	0.672	0.764	1.636
31.5	0.366	0.549	0.66	0.536	0.562	0.91
40	0.451	0.823	1.142	0.722	0.491	1.034
50	3.559	6.267	9.126	7.348	2.29	9.182
63	0.944	1.458	1.999	1.586	1.359	1.932
80	1.192	1.305	0.952	0.765	4.005	0.938
100	0.809	1.355	0.838	0.564	3.813	0.727
125	1.502	4.51	3.689	5.927	10.98	2.714
160	2.676	8.138	6.749	10.9	19.68	4.842
200	0.351	1.279	0.814	0.675	1.19	0.779
250	1.337	2.648	1.105	0.6	2.131	0.971
315	2.6	5.078	1.886	0.95	4.216	1.899
400	0.454	1.205	1.687	0.526	1.459	1.306
500	0.334	0.948	1.002	0.355	0.896	0.972
630	0.915	4.707	2.358	1.933	1.516	2.472
800	1.662	10.17	3.501	3.54	3.619	3.779
1000	2.184	9.089	6.529	2.347	3.414	1.893
1250	4.335	7.227	3.839	1.419	1.595	3.69
ahw	**1.624**	**2.673**	**3.335**	**3.0**	**3.0**	**3.4**
av		**4.6**			**5.5**	



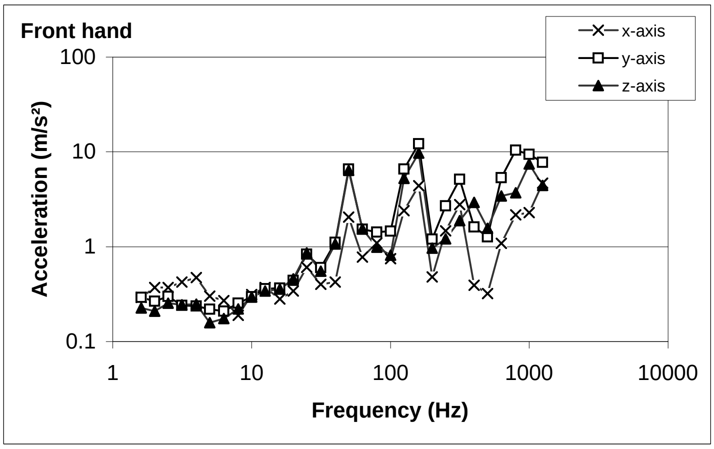


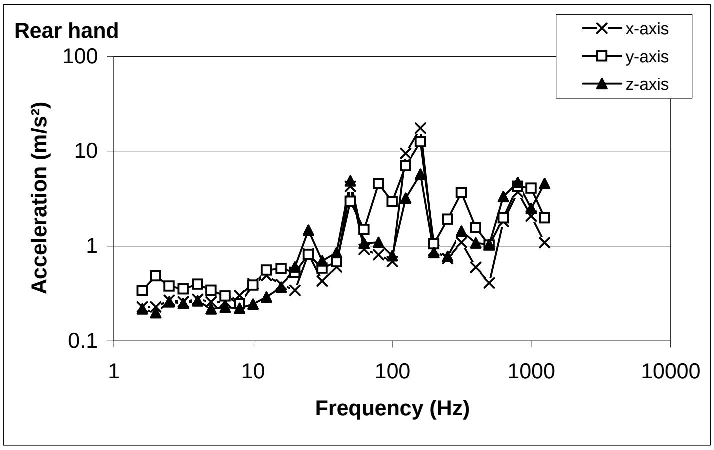


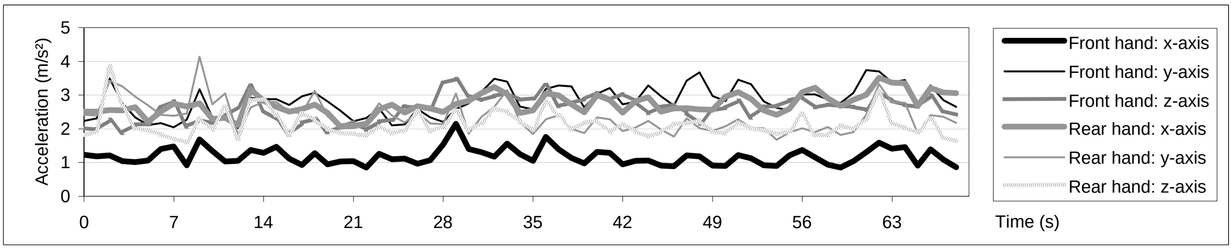
MainID: 1381, ResultsID: 9989

LocationName:		MachineManufacturer:	
		MachineModel:	
Occupation:	Grounds Maintenance	HSLAnonymisedToolLetter:	Machine B
Process:	Cutting thick shrub	MachineModifications:	
RecordDate:	October 20, 2010	MachineSize:	600mm blade
		MainID:	1381
		MachineWeight(kg):	5.7
		ResultsID:	9990
TapeNumber:	N/A	MachineOperating pressure:	
Operator#:	OP#3	MachineSpeed(impacts/min):	
	Horizontal operation	MachineSpeed(revs/min):	
VideoNumber:	N/A	MachinePower:	
		MachinePower source:	2 stroke oil mix
		MeasurementTime:	69 Seconds
Notes:		NumShotsInMeas:	
		InsertedTool:	
		DailyExposureTime:	
DC-shift threshold:	*10 mm*	InsertedToolType:	
		A(8) Front hand	m/s²
		InsertedToolManufacturer:	

	Front hand			Rear hand		
Frequency	x-axis	y-axis	z-axis	x-axis	y-axis	z-axis
1.6	0.293	0.291	0.227	0.227	0.34	0.217
2	0.371	0.266	0.21	0.227	0.483	0.198
2.5	0.372	0.3	0.255	0.268	0.376	0.258
3.15	0.423	0.24	0.244	0.258	0.352	0.249
4	0.472	0.236	0.249	0.274	0.395	0.264
5	0.302	0.219	0.158	0.259	0.34	0.217
6.3	0.27	0.209	0.175	0.258	0.297	0.226
8	0.189	0.253	0.221	0.302	0.246	0.221
10	0.312	0.296	0.295	0.401	0.385	0.243
12.5	0.372	0.36	0.34	0.489	0.557	0.29
16	0.281	0.365	0.356	0.392	0.578	0.37
20	0.342	0.441	0.457	0.341	0.528	0.602
25	0.607	0.836	0.859	0.829	0.812	1.465
31.5	0.401	0.601	0.551	0.428	0.585	0.699
40	0.425	1.112	1.067	0.604	0.684	0.852
50	2.047	6.57	6.365	4.256	2.952	4.87
63	0.776	1.525	1.542	0.923	1.491	1.067
80	1.094	1.429	0.987	0.811	4.538	1.098
100	0.747	1.456	0.817	0.686	2.927	0.793
125	2.401	6.576	5.253	9.509	7.004	3.195
160	4.383	12.15	9.702	17.51	12.6	5.724
200	0.479	1.204	0.964	0.903	1.052	0.852
250	1.469	2.706	1.208	0.737	1.914	0.777
315	2.787	5.129	1.889	1.093	3.663	1.436
400	0.394	1.614	2.939	0.599	1.569	1.082
500	0.321	1.272	1.569	0.408	1.018	1.036
630	1.087	5.348	3.43	1.82	1.974	3.332
800	2.164	10.44	3.7	3.707	4.256	4.689
1000	2.287	9.403	7.457	2.078	4.057	2.487
1250	4.671	7.774	4.433	1.089	1.981	4.561
ahw	**1.259**	**2.887**	**2.647**	**2.8**	**2.5**	**2.2**
av		**4.1**			**4.3**	



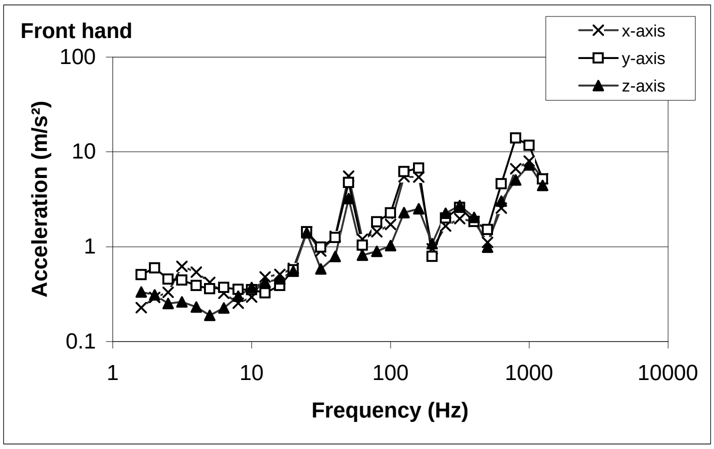


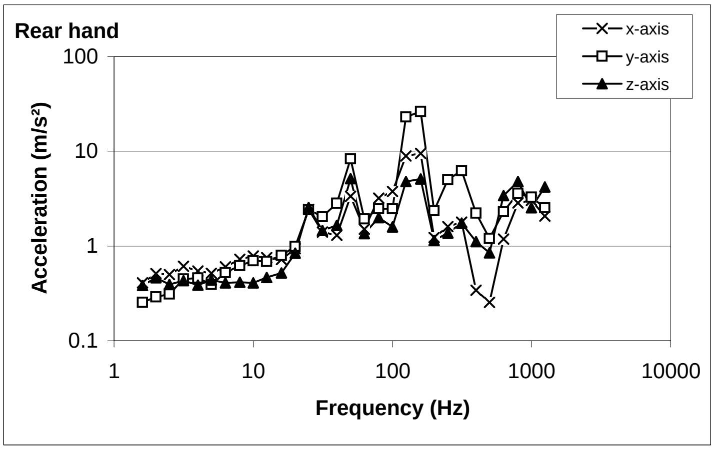


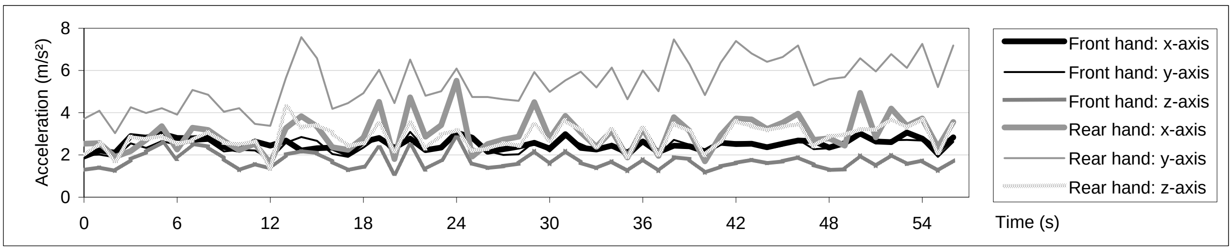
MainID: 1381, ResultsID: 9990

LocationName:		MachineManufacturer:			
		MachineModel:			
Occupation:	Grounds Maintenance			HSLAnonymisedToolLetter:	Machine B
Process:	Cutting thick shrub	MachineModifications:			
RecordDate:	October 20, 2010	MachineSize:	600mm blade	MainID:	1382
		MachineWeight(kg):	5.7	ResultsID:	9991
TapeNumber:	N/A	MachineOperating pressure:			
Operator#:	OP#1	MachineSpeed(impacts/min):			
	Vertical operation	MachineSpeed(revs/min):			
VideoNumber:	N/A	MachinePower:			
		MachinePower source:	2 stroke oil mix	MeasurementTime:	57 Seconds
Notes:				NumShotsInMeas:	
		InsertedTool:		DailyExposureTime:	
DC-shift threshold:	*10 mm*	InsertedToolType:		A(8) Front hand	m/s²
		InsertedToolManufacturer:			

	Front hand			Rear hand		
Frequency	x-axis	y-axis	z-axis	x-axis	y-axis	z-axis
1.6	0.228	0.508	0.333	0.408	0.255	0.382
2	0.292	0.599	0.312	0.51	0.29	0.463
2.5	0.33	0.454	0.252	0.498	0.31	0.393
3.15	0.619	0.445	0.262	0.613	0.447	0.43
4	0.538	0.389	0.232	0.544	0.46	0.386
5	0.42	0.362	0.19	0.517	0.393	0.437
6.3	0.324	0.372	0.226	0.601	0.524	0.409
8	0.254	0.354	0.302	0.728	0.62	0.414
10	0.294	0.353	0.372	0.787	0.696	0.409
12.5	0.479	0.326	0.42	0.752	0.686	0.466
16	0.51	0.389	0.46	0.717	0.795	0.518
20	0.591	0.568	0.554	0.937	0.992	0.843
25	1.432	1.436	1.402	2.443	2.417	2.551
31.5	0.903	0.991	0.584	1.403	2.034	1.462
40	1.287	1.249	0.787	1.296	2.829	1.655
50	5.575	4.758	3.233	3.364	8.29	5.147
63	1.206	1.039	0.814	1.509	1.938	1.353
80	1.439	1.83	0.892	3.205	2.484	1.987
100	1.719	2.273	1.031	3.758	2.473	1.595
125	5.468	6.18	2.288	8.904	23.07	4.801
160	5.43	6.741	2.512	9.53	26.22	5.089
200	0.95	0.788	1.079	1.231	2.365	1.144
250	1.659	2.006	2.254	1.608	5.015	1.369
315	1.981	2.603	2.709	1.78	6.229	1.746
400	1.842	1.841	2.034	0.341	2.222	1.114
500	1.113	1.519	0.987	0.255	1.205	0.848
630	2.551	4.596	3.037	1.183	2.315	3.396
800	6.644	14	5.042	2.857	3.606	4.81
1000	8.025	11.73	7.267	3.04	3.279	2.534
1250	5.219	5.198	4.433	2.074	2.543	4.196
ahw	**2.582**	**2.475**	**1.794**	**3.2**	**5.6**	**3.0**
av		**4.0**			**7.1**	



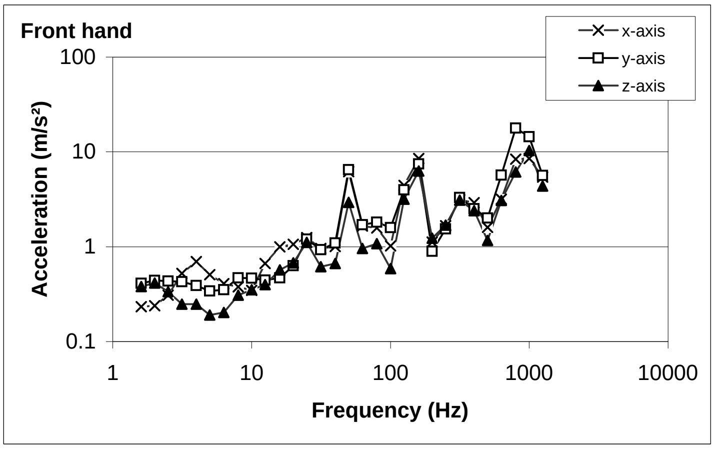


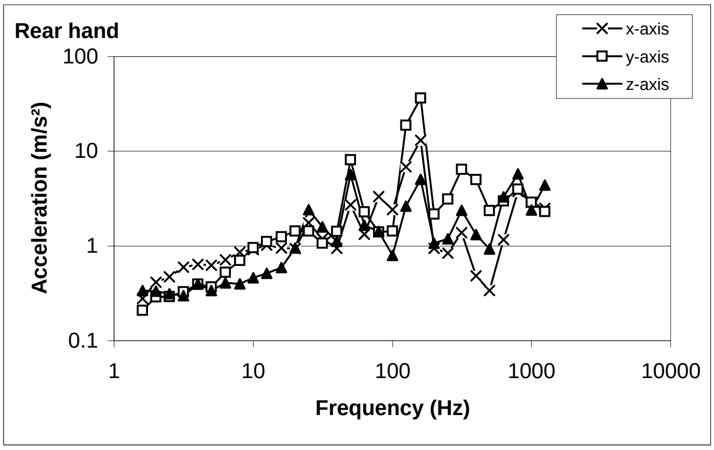


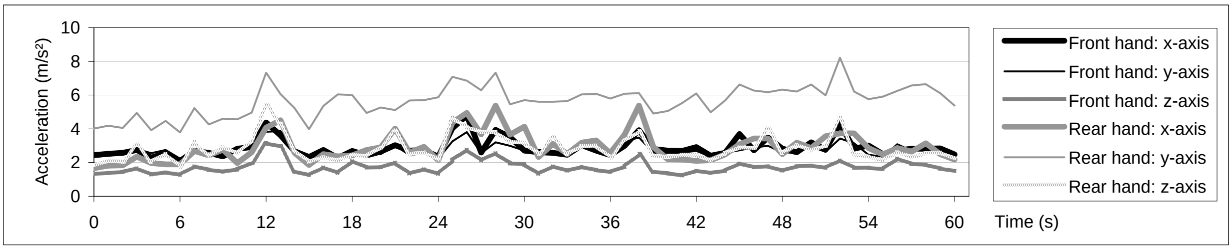
MainID: 1382, ResultsID: 9991

LocationName:	[redacted]	MachineManufacturer:	[redacted]		
		MachineModel:			
Occupation:	Grounds Maintenance			HSLAnonymisedToolLetter:	Machine B
Process:	Cutting thick shrub	MachineModifications:			
RecordDate:	October 20, 2010	MachineSize:	600mm blade	MainID:	1382
		MachineWeight(kg):	5.7	ResultsID:	9992
TapeNumber:	N/A	MachineOperating pressure:			
Operator#:	OP#2	MachineSpeed(impacts/min):			
	Vertical operation	MachineSpeed(revs/min):			
VideoNumber:	N/A	MachinePower:			
		MachinePower source:	2 stroke oil mix	MeasurementTime:	61.5 Seconds
Notes:				NumShotsInMeas:	
		InsertedTool:		DailyExposureTime:	
DC-shift threshold:	*10 mm*	InsertedToolType:		A(8) Front hand	m/s²
		InsertedToolManufacturer:	[redacted]		

	Front hand			Rear hand		
Frequency	x-axis	y-axis	z-axis	x-axis	y-axis	z-axis
1.6	0.233	0.413	0.379	0.279	0.209	0.339
2	0.24	0.442	0.413	0.415	0.289	0.333
2.5	0.309	0.434	0.337	0.472	0.293	0.314
3.15	0.522	0.427	0.248	0.599	0.327	0.3
4	0.697	0.39	0.247	0.64	0.395	0.396
5	0.507	0.343	0.191	0.627	0.369	0.34
6.3	0.41	0.351	0.202	0.716	0.525	0.409
8	0.378	0.468	0.308	0.86	0.705	0.398
10	0.347	0.465	0.353	0.913	0.961	0.463
12.5	0.668	0.445	0.4	1.02	1.114	0.515
16	1.001	0.468	0.571	0.954	1.247	0.594
20	1.061	0.632	0.677	0.939	1.438	0.952
25	1.252	1.205	1.114	1.758	1.44	2.422
31.5	0.959	0.928	0.617	1.193	1.072	1.59
40	1.008	1.092	0.666	0.941	1.43	1.117
50	6.185	6.505	2.938	2.71	8.129	5.702
63	1.647	1.71	0.963	1.328	2.284	1.654
80	1.574	1.821	1.079	3.318	1.4	1.423
100	1.024	1.594	0.589	2.426	1.441	0.794
125	4.417	3.97	3.165	6.865	18.76	2.632
160	8.517	7.481	6.29	13.05	36.44	5.044
200	1.118	0.897	1.226	0.947	2.161	1.072
250	1.661	1.541	1.692	0.842	3.132	1.19
315	3.118	3.305	3.108	1.378	6.463	2.382
400	2.924	2.516	2.397	0.485	5.008	1.32
500	1.608	2.011	1.168	0.34	2.363	0.929
630	3.171	5.681	3.077	1.164	2.976	3.31
800	8.392	17.88	6.122	3.777	3.979	5.754
1000	8.532	14.48	10.32	2.9	2.899	2.402
1250	5.434	5.623	4.366	2.503	2.307	4.408
ahw	**2.989**	**2.836**	**1.818**	**3.1**	**5.8**	**3.0**
av		**4.5**			**7.2**	



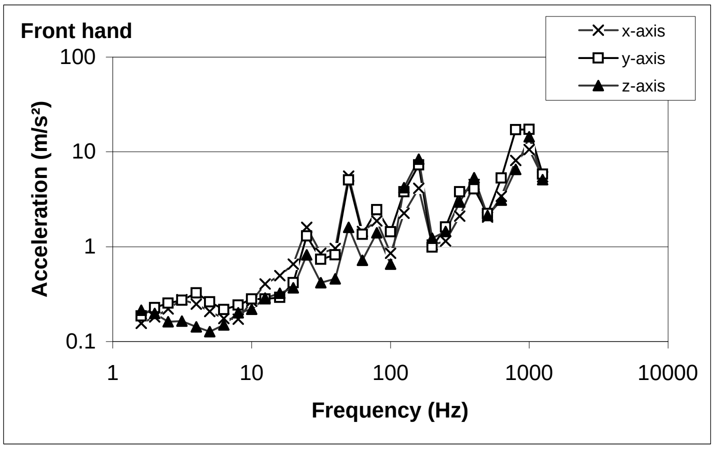


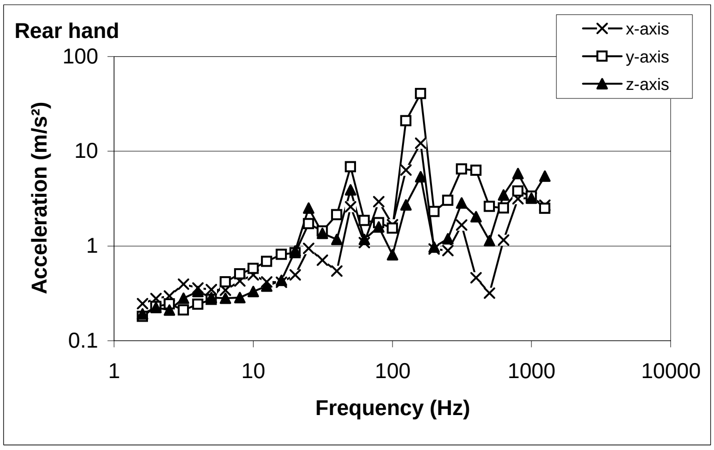


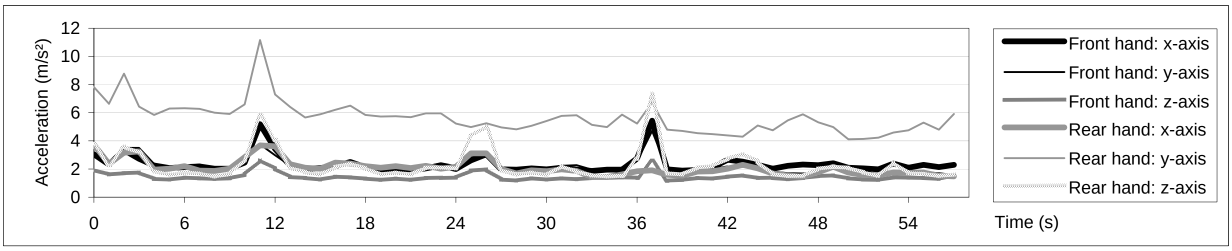
MainID: 1382, ResultsID: 9992

LocationName:	[redacted]	MachineManufacturer: MachineModel:	[redacted]		
Occupation:	Grounds Maintenance			HSLAnonymisedToolLetter:	Machine B
Process:	Cutting thick shrub	MachineModifications:			
RecordDate:	October 20, 2010	MachineSize:	600mm blade	MainID:	1382
		MachineWeight(kg):	5.7	ResultsID:	9993
TapeNumber:	N/A	MachineOperating pressure:			
Operator#:	OP#3	MachineSpeed(impacts/min):			
	Vertical operation	MachineSpeed(revs/min):			
VideoNumber:	N/A	MachinePower:			
		MachinePower source:	2 stroke oil mix	MeasurementTime:	58.5 Seconds
Notes:				NumShotsInMeas:	
		InsertedTool:		DailyExposureTime:	
DC-shift threshold:	*10 mm*	InsertedToolType:		A(8) Front hand	m/s²
		InsertedToolManufacturer:	[redacted]		

	Front hand			Rear hand		
Frequency	x-axis	y-axis	z-axis	x-axis	y-axis	z-axis
1.6	0.155	0.186	0.214	0.246	0.18	0.192
2	0.182	0.229	0.198	0.278	0.23	0.224
2.5	0.222	0.254	0.162	0.297	0.244	0.211
3.15	0.277	0.273	0.164	0.395	0.211	0.282
4	0.249	0.325	0.143	0.36	0.243	0.331
5	0.207	0.261	0.127	0.347	0.273	0.284
6.3	0.176	0.217	0.15	0.34	0.417	0.282
8	0.173	0.242	0.201	0.429	0.506	0.286
10	0.265	0.281	0.22	0.494	0.579	0.331
12.5	0.404	0.28	0.289	0.419	0.686	0.377
16	0.498	0.292	0.323	0.415	0.813	0.435
20	0.654	0.418	0.368	0.494	0.847	0.887
25	1.601	1.303	0.821	0.941	1.714	2.516
31.5	0.851	0.736	0.417	0.707	1.433	1.357
40	0.956	0.822	0.458	0.543	2.128	1.177
50	5.567	5.058	1.607	2.589	6.833	3.92
63	1.45	1.35	0.718	1.087	1.858	1.179
80	1.875	2.464	1.404	2.948	1.752	1.586
100	0.854	1.435	0.654	1.683	1.54	0.812
125	2.248	3.782	4.211	6.338	20.96	2.726
160	4.128	7.272	8.392	12.19	40.74	5.37
200	1.046	0.99	1.235	0.931	2.308	0.977
250	1.145	1.611	1.452	0.895	3.039	1.194
315	2.1	3.798	2.967	1.666	6.471	2.853
400	4.536	4.081	5.357	0.462	6.303	2.046
500	2.052	2.243	2.134	0.318	2.621	1.138
630	3.397	5.288	3.112	1.158	2.517	3.469
800	8.139	17.14	6.528	3.143	3.784	5.832
1000	10.62	17.26	14.41	3.221	3.362	3.205
1250	5.485	5.827	5.094	2.694	2.49	5.468
ahw	**2.468**	**2.354**	**1.501**	**2.2**	**5.8**	**2.6**
av		**3.7**			**6.8**	



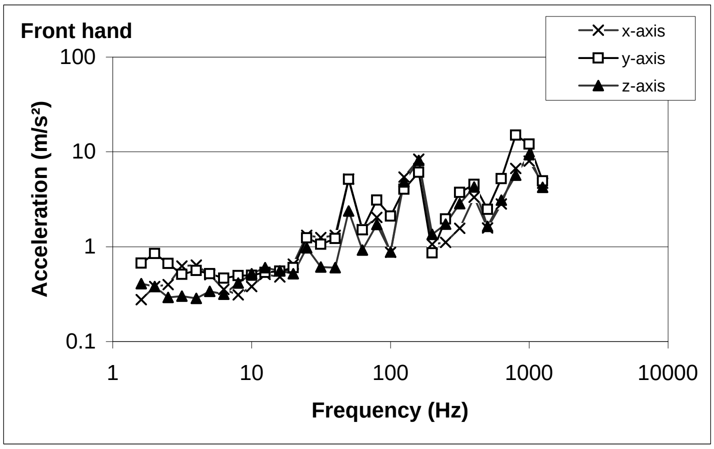


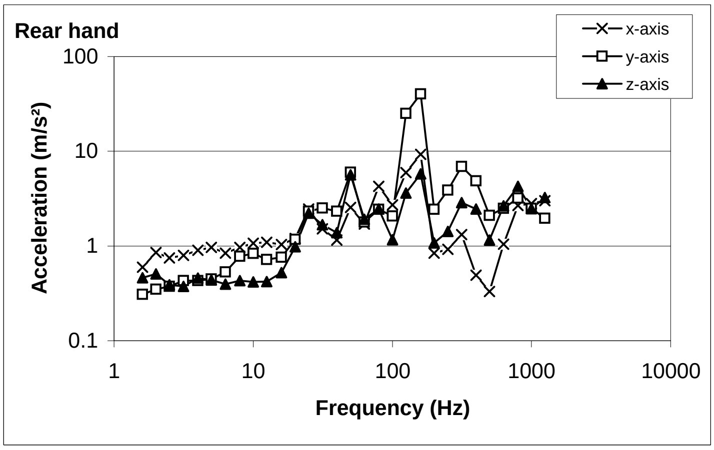


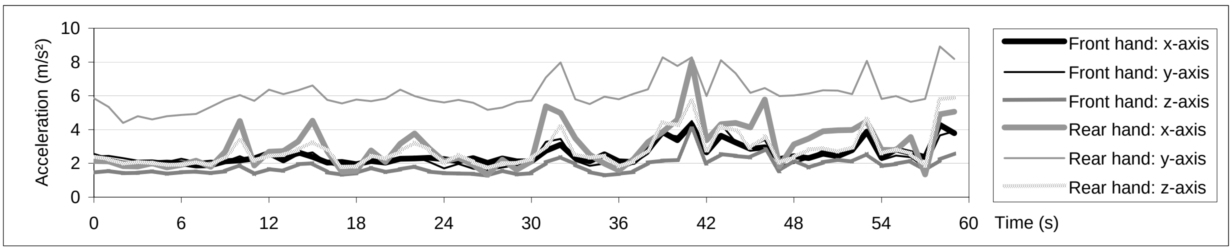
MainID: 1382, ResultsID: 9993

LocationName:		MachineManufacturer:	
		MachineModel:	
Occupation:	Grounds Maintenance	HSLAnonymisedToolLetter:	Machine B
Process:	Cutting thin shrub	MachineModifications:	
RecordDate:	October 20, 2010	MachineSize:	600mm blade
		MainID:	1383
		MachineWeight(kg):	5.7
		ResultsID:	9994
TapeNumber:	N/A	MachineOperating pressure:	
Operator#:	OP#1	MachineSpeed(impacts/min):	
	Vertical operation	MachineSpeed(revs/min):	
VideoNumber:	N/A	MachinePower:	
		MachinePower source:	2 stroke oil mix
		MeasurementTime:	60 Seconds
Notes:		NumShotsInMeas:	
		InsertedTool:	
		DailyExposureTime:	
DC-shift threshold:	*10 mm*	InsertedToolType:	
		A(8) Front hand	m/s²
		InsertedToolManufacturer:	

	Front hand			Rear hand		
Frequency	x-axis	y-axis	z-axis	x-axis	y-axis	z-axis
1.6	0.276	0.673	0.409	0.599	0.308	0.461
2	0.381	0.85	0.381	0.857	0.35	0.509
2.5	0.398	0.666	0.293	0.747	0.376	0.389
3.15	0.626	0.513	0.301	0.794	0.429	0.376
4	0.64	0.562	0.286	0.898	0.431	0.46
5	0.506	0.52	0.339	0.968	0.447	0.436
6.3	0.355	0.466	0.317	0.84	0.531	0.395
8	0.31	0.496	0.415	0.968	0.78	0.432
10	0.382	0.5	0.52	1.071	0.833	0.418
12.5	0.511	0.537	0.601	1.097	0.72	0.421
16	0.48	0.552	0.558	1.04	0.758	0.525
20	0.657	0.602	0.52	1.204	1.172	0.986
25	1.315	1.237	0.976	2.458	2.32	2.219
31.5	1.253	1.058	0.61	1.522	2.517	1.683
40	1.322	1.217	0.601	1.157	2.318	1.382
50	5.194	5.121	2.388	2.553	6.026	5.627
63	1.519	1.504	0.925	1.703	1.78	1.913
80	2.042	3.1	1.715	4.279	2.43	2.459
100	0.875	2.108	0.882	2.723	2.077	1.165
125	5.428	4.047	4.846	5.964	25.12	3.614
160	8.39	6.097	8.099	9.279	40.34	5.754
200	1.058	0.857	1.353	0.844	2.444	1.079
250	1.109	1.966	1.732	0.92	3.898	1.423
315	1.559	3.747	2.84	1.321	6.9	2.862
400	3.331	4.543	4.279	0.491	4.864	2.455
500	1.576	2.483	1.645	0.33	2.108	1.156
630	2.834	5.239	3.105	1.048	2.487	2.655
800	6.678	14.96	5.687	2.681	3.201	4.265
1000	7.985	12.13	9.368	2.813	2.491	2.473
1250	4.698	4.935	4.239	3.01	1.962	3.244
ahw	**2.647**	**2.624**	**1.934**	**3.5**	**6.3**	**3.0**
av		**4.2**			**7.8**	







MainID: 1383, ResultsID: 9994

LocationName:

Occupation: Grounds Maintenance
Process: Cutting thin shrub
RecordDate: October 20, 2010

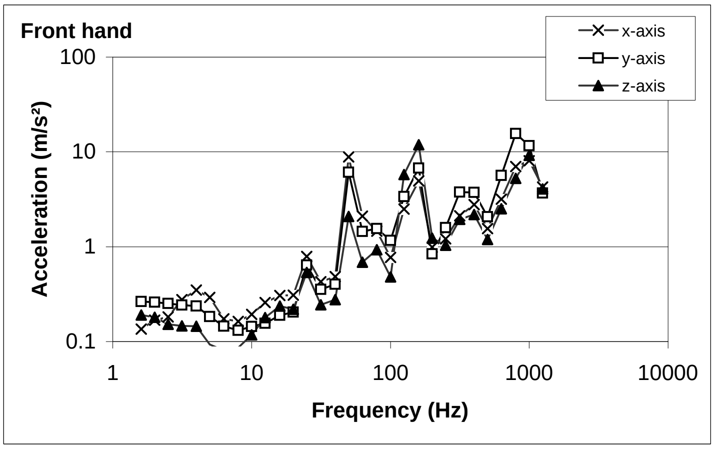
TapeNumber: N/A
Operator#: OP#2
Vertical operation
VideoNumber: N/A

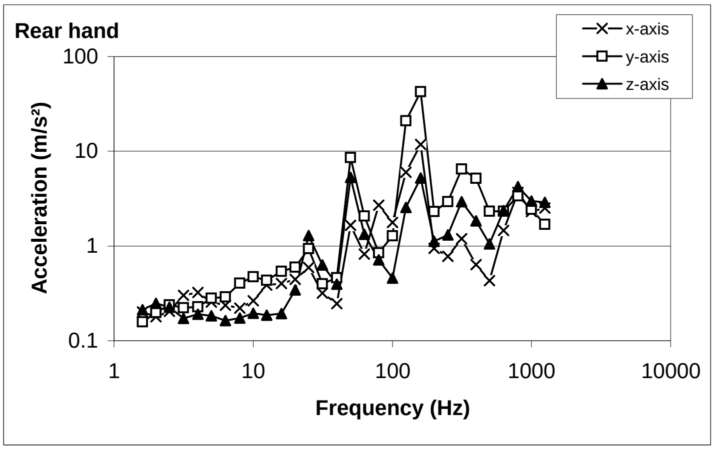
Notes:

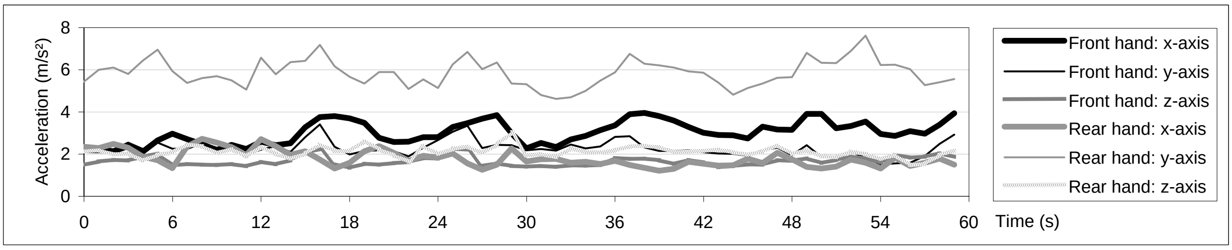
DC-shift threshold: 10 mm

MachineManufacturer:
MachineModel:
HSLAnonymisedToolLetter: Machine B
MachineModifications:
MachineSize: 600mm blade
MainID: 1383
MachineWeight(kg): 5.7
ResultsID: 9995
MachineOperating pressure:
MachineSpeed(impacts/min):
MachineSpeed(revs/min):
MachinePower:
MachinePower source: 2 stroke oil mix
MeasurementTime: 60.75 Seconds
NumShotsInMeas:
InsertedTool:
DailyExposureTime:
InsertedToolType:
A(8) Front hand m/s²
InsertedToolManufacturer:

	Front hand			Rear hand		
Frequency	x-axis	y-axis	z-axis	x-axis	y-axis	z-axis
1.6	0.135	0.264	0.19	0.201	0.159	0.212
2	0.168	0.26	0.181	0.179	0.198	0.248
2.5	0.182	0.252	0.152	0.204	0.238	0.227
3.15	0.277	0.242	0.147	0.301	0.223	0.172
4	0.348	0.237	0.146	0.324	0.227	0.191
5	0.291	0.183	0.093	0.257	0.28	0.183
6.3	0.174	0.146	0.081	0.237	0.291	0.164
8	0.163	0.131	0.086	0.221	0.404	0.173
10	0.194	0.144	0.118	0.265	0.472	0.196
12.5	0.259	0.156	0.18	0.388	0.435	0.187
16	0.307	0.189	0.236	0.402	0.538	0.193
20	0.308	0.205	0.219	0.443	0.599	0.345
25	0.79	0.639	0.537	0.591	0.941	1.287
31.5	0.427	0.355	0.245	0.317	0.4	0.632
40	0.484	0.402	0.276	0.247	0.46	0.395
50	8.825	6.091	2.092	1.65	8.581	5.306
63	2.11	1.453	0.685	0.82	2.066	1.328
80	1.462	1.551	0.927	2.698	0.847	0.713
100	0.772	1.167	0.479	1.767	1.282	0.458
125	2.486	3.385	5.785	6.021	20.96	2.55
160	4.959	6.758	11.94	11.85	42.39	5.208
200	0.986	0.84	1.234	0.947	2.308	1.12
250	1.215	1.592	1.034	0.777	2.945	1.312
315	2.127	3.775	1.945	1.194	6.504	2.933
400	2.781	3.744	2.183	0.633	5.198	1.84
500	1.551	2.073	1.19	0.43	2.321	1.056
630	3.179	5.651	2.522	1.456	2.331	2.366
800	7.002	15.67	5.277	3.681	3.371	4.228
1000	8.042	11.61	9.207	2.305	2.44	2.991
1250	4.252	3.687	4.066	2.519	1.691	2.894
ahw	**3.111**	**2.325**	**1.692**	**1.9**	**5.9**	**2.1**
av		**4.2**			**6.6**	



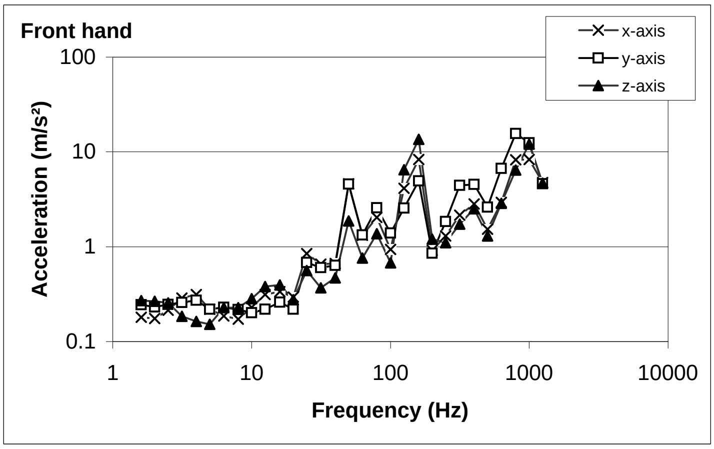


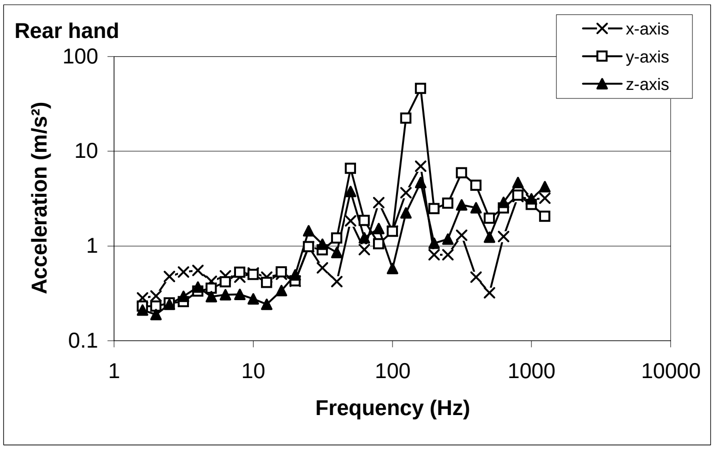


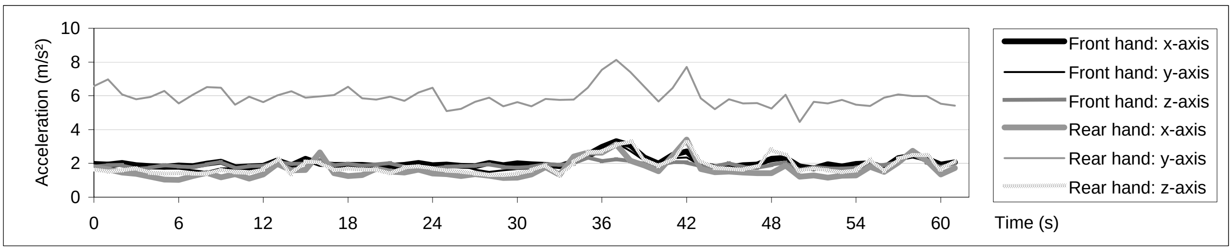
MainID: 1383, ResultsID: 9995

LocationName:		MachineManufacturer:			
		MachineModel:			
Occupation:	Grounds Maintenance			HSLAnonymisedToolLetter:	Machine B
Process:	Cutting thin shrub	MachineModifications:			
RecordDate:	October 20, 2010	MachineSize:	600mm blade	MainID:	1383
		MachineWeight(kg):	5.7	ResultsID:	9996
TapeNumber:	N/A	MachineOperating pressure:			
Operator#:	OP#3	MachineSpeed(impacts/min):			
	Vertical operation	MachineSpeed(revs/min):			
VideoNumber:	N/A	MachinePower:			
		MachinePower source:	2 stroke oil mix	MeasurementTime:	62.5 Seconds
Notes:				NumShotsInMeas:	
		InsertedTool:		DailyExposureTime:	
DC-shift threshold:	*10 mm*	InsertedToolType:		A(8) Front hand	m/s²
		InsertedToolManufacturer:			

	Front hand			Rear hand		
Frequency	x-axis	y-axis	z-axis	x-axis	y-axis	z-axis
1.6	0.181	0.245	0.27	0.282	0.232	0.211
2	0.174	0.231	0.267	0.296	0.231	0.189
2.5	0.215	0.247	0.256	0.476	0.249	0.242
3.15	0.288	0.257	0.185	0.533	0.259	0.295
4	0.314	0.272	0.163	0.554	0.334	0.37
5	0.219	0.22	0.152	0.423	0.357	0.293
6.3	0.187	0.23	0.228	0.483	0.418	0.305
8	0.172	0.218	0.229	0.471	0.529	0.308
10	0.23	0.202	0.283	0.519	0.501	0.277
12.5	0.313	0.219	0.381	0.468	0.411	0.243
16	0.335	0.259	0.394	0.502	0.533	0.338
20	0.294	0.219	0.276	0.424	0.427	0.495
25	0.844	0.68	0.563	0.983	0.983	1.453
31.5	0.655	0.603	0.368	0.586	0.912	1.047
40	0.665	0.635	0.469	0.421	1.213	0.855
50	4.617	4.591	1.877	1.841	6.576	3.768
63	1.32	1.334	0.761	0.918	1.859	1.222
80	2.035	2.577	1.368	2.867	1.052	1.529
100	0.937	1.389	0.675	1.439	1.427	0.579
125	4.139	2.545	6.482	3.637	22.34	2.234
160	8.323	4.956	13.6	6.958	45.98	4.666
200	0.916	0.854	1.201	0.807	2.472	1.069
250	1.3	1.845	1.104	0.809	2.823	1.184
315	2.152	4.433	1.734	1.296	5.888	2.712
400	2.834	4.533	2.508	0.469	4.375	2.525
500	1.525	2.617	1.296	0.322	1.957	1.237
630	2.934	6.67	2.874	1.256	2.505	2.882
800	8.279	15.6	6.453	3.326	3.444	4.689
1000	8.302	12.5	12.05	3.091	2.748	3.159
1250	4.761	4.603	4.695	3.19	2.053	4.24
ahw	**2.111**	**1.969**	**1.948**	**1.8**	**6.0**	**2.0**
av		**3.5**			**6.6**	



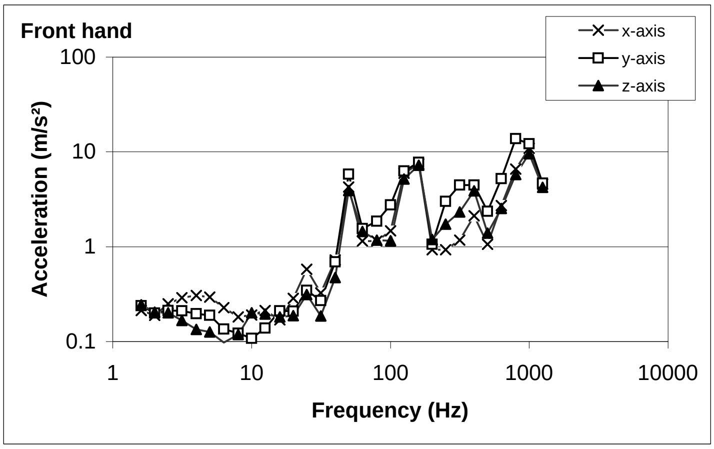


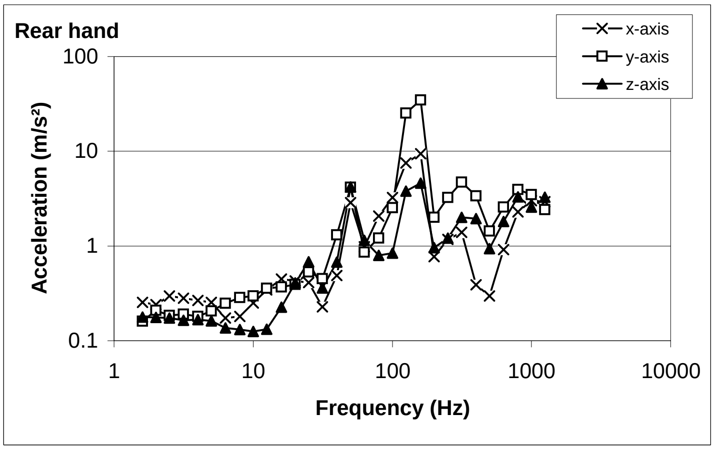


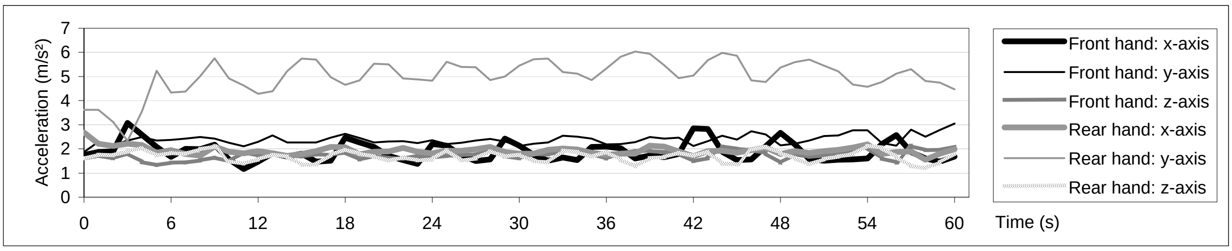
MainID: 1383, ResultsID: 9996

LocationName:	[redacted]	MachineManufacturer:	[redacted]
		MachineModel:	
Occupation:	Grounds Maintenance		HSLAnonymisedToolLetter: Machine B
Process:	Cutting conifer	MachineModifications:	
RecordDate:	October 20, 2010	MachineSize: 600mm blade	MainID: 1384
		MachineWeight(kg): 5.7	ResultsID: 9997
TapeNumber:	N/A	MachineOperating pressure:	
Operator#:	OP#1	MachineSpeed(impacts/min):	
	Vertical operation	MachineSpeed(revs/min):	
VideoNumber:	N/A	MachinePower:	
		MachinePower source: 2 stroke oil mix	MeasurementTime: 61 Seconds
Notes:			NumShotsInMeas:
		InsertedTool:	DailyExposureTime:
DC-shift threshold:	*10 mm*	InsertedToolType:	A(8) Front hand m/s²
		InsertedToolManufacturer: [redacted]	

	Front hand			Rear hand		
Frequency	x-axis	y-axis	z-axis	x-axis	y-axis	z-axis
1.6	0.212	0.239	0.245	0.255	0.161	0.177
2	0.189	0.2	0.204	0.241	0.21	0.176
2.5	0.251	0.212	0.202	0.298	0.185	0.174
3.15	0.291	0.211	0.167	0.281	0.191	0.164
4	0.305	0.196	0.135	0.266	0.18	0.167
5	0.294	0.189	0.126	0.254	0.205	0.163
6.3	0.228	0.135	0.098	0.174	0.249	0.137
8	0.182	0.122	0.119	0.181	0.285	0.131
10	0.19	0.108	0.201	0.251	0.298	0.125
12.5	0.212	0.138	0.195	0.344	0.358	0.132
16	0.17	0.211	0.182	0.449	0.368	0.226
20	0.286	0.209	0.188	0.429	0.394	0.409
25	0.581	0.346	0.314	0.41	0.531	0.682
31.5	0.325	0.27	0.186	0.228	0.453	0.362
40	0.723	0.692	0.474	0.489	1.312	0.674
50	4.28	5.824	3.911	2.868	4.167	4.184
63	1.15	1.559	1.451	0.984	0.859	1.143
80	1.151	1.86	1.178	2.072	1.215	0.796
100	1.472	2.758	1.159	3.262	2.534	0.84
125	5.966	6.291	5.196	7.526	25.37	3.798
160	7.445	7.757	7.229	9.446	34.85	4.616
200	0.927	1.057	1.195	0.769	2.001	0.963
250	0.929	3.015	1.733	1.176	3.257	1.213
315	1.171	4.464	2.333	1.397	4.727	2.001
400	2.125	4.467	3.88	0.388	3.371	1.939
500	1.059	2.363	1.396	0.296	1.437	0.935
630	2.728	5.213	2.537	0.913	2.572	1.808
800	6.608	13.76	5.763	2.295	3.956	3.305
1000	10.94	12.21	9.595	3.015	3.472	2.565
1250	4.569	4.695	4.22	2.931	2.411	3.283
ahw	**1.956**	**2.416**	**1.77**	**2.0**	**5.1**	**1.7**
av		**3.6**			**5.7**	







MainID: 1384, ResultsID: 9997

LocationName:

Occupation: Grounds Maintenance
Process: Cutting conifer
RecordDate: October 20, 2010

TapeNumber: N/A
Operator#: OP#2
Vertical operation
VideoNumber: N/A

Notes:

DC-shift threshold: 10 mm

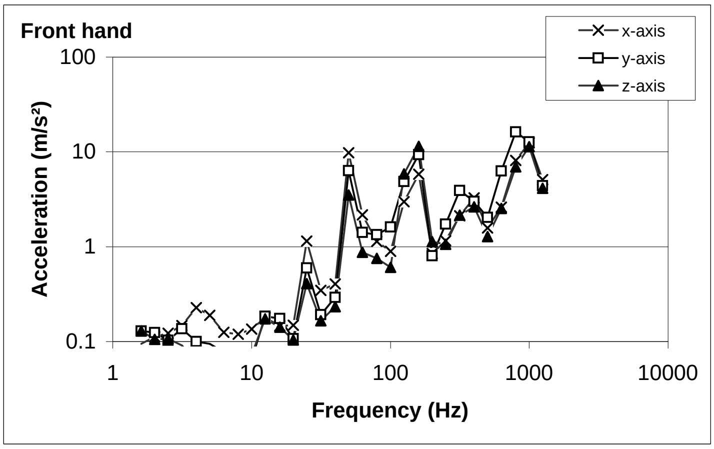
MachineManufacturer:
MachineModel:

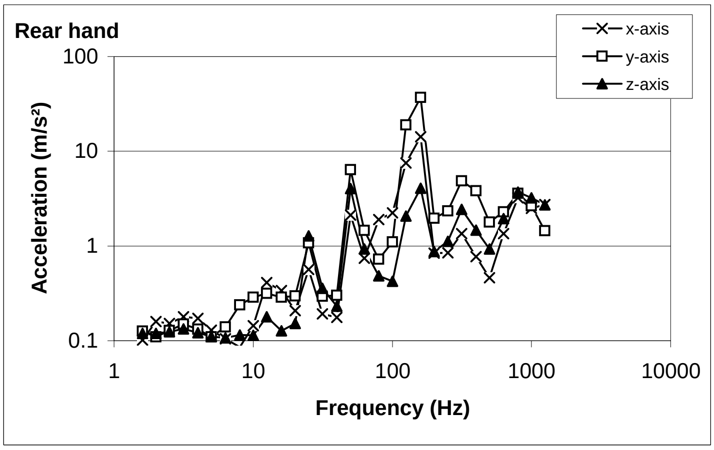
HSLAnonymisedToolLetter: Machine B

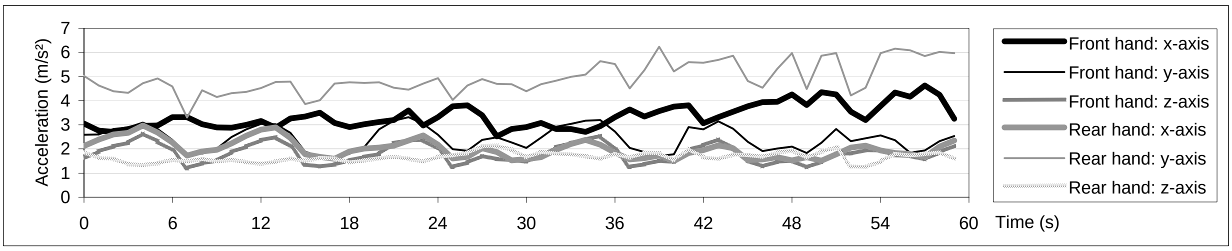
MachineModifications:
MachineSize: 600mm blade
MachineWeight(kg): 5.7
MainID: 1384
ResultsID: 9998

MachineOperating pressure:
MachineSpeed(impacts/min):
MachineSpeed(revs/min):
MachinePower:
MachinePower source: 2 stroke oil mix
MeasurementTime: 60 Seconds
NumShotsInMeas:
InsertedTool:
DailyExposureTime:
InsertedToolType:
A(8) Front hand m/s²
InsertedToolManufacturer:

	Front hand			Rear hand		
Frequency	x-axis	y-axis	z-axis	x-axis	y-axis	z-axis
1.6	0.095	0.129	0.13	0.101	0.127	0.119
2	0.112	0.124	0.105	0.16	0.11	0.119
2.5	0.122	0.103	0.107	0.153	0.128	0.124
3.15	0.148	0.136	0.091	0.18	0.15	0.133
4	0.229	0.1	0.062	0.172	0.132	0.121
5	0.189	0.094	0.052	0.13	0.11	0.11
6.3	0.126	0.077	0.041	0.104	0.139	0.108
8	0.119	0.065	0.05	0.086	0.239	0.115
10	0.135	0.064	0.073	0.145	0.288	0.115
12.5	0.179	0.185	0.174	0.41	0.315	0.179
16	0.146	0.175	0.142	0.34	0.287	0.127
20	0.148	0.107	0.104	0.207	0.297	0.152
25	1.151	0.595	0.409	0.567	1.076	1.274
31.5	0.345	0.191	0.166	0.192	0.295	0.358
40	0.406	0.292	0.233	0.177	0.303	0.231
50	9.761	6.341	3.502	2.118	6.408	4.026
63	2.162	1.413	0.872	0.742	1.459	0.93
80	1.139	1.34	0.751	1.894	0.724	0.482
100	0.892	1.616	0.608	2.236	1.106	0.424
125	2.972	4.865	5.855	7.543	18.97	2.078
160	5.842	9.348	11.42	14.23	36.91	4.084
200	0.846	0.802	1.126	0.839	1.954	0.871
250	1.154	1.731	1.064	0.845	2.353	1.12
315	2.119	3.921	2.144	1.353	4.878	2.44
400	3.264	3.013	2.629	0.773	3.812	1.474
500	1.578	2.032	1.279	0.462	1.785	0.931
630	2.614	6.278	2.53	1.346	2.296	1.94
800	8.11	16.28	6.968	3.231	3.591	3.718
1000	12.49	12.75	11.31	2.488	2.651	3.231
1250	5.097	4.405	4.136	2.737	1.447	2.724
ahw	**3.424**	**2.498**	**1.865**	**2.1**	**5.0**	**1.7**
av		**4.6**			**5.7**	







MainID: 1384, ResultsID: 9998

LocationName: [redacted]

Occupation: Grounds Maintenance
Process: Cutting conifer
RecordDate: October 20, 2010

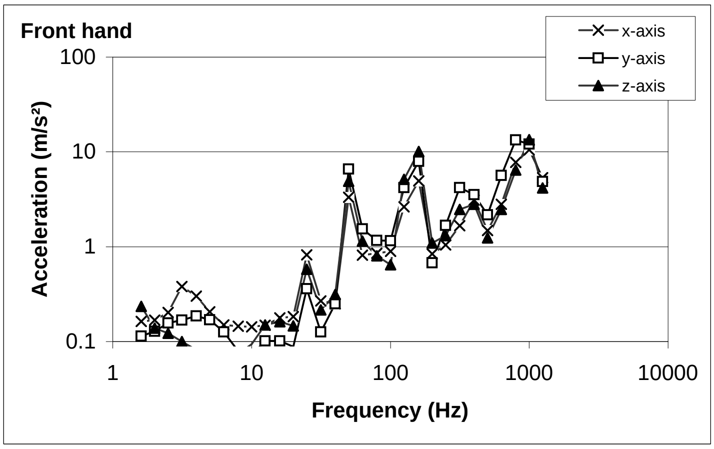
TapeNumber: N/A
Operator#: OP#3
Vertical operation
VideoNumber: N/A

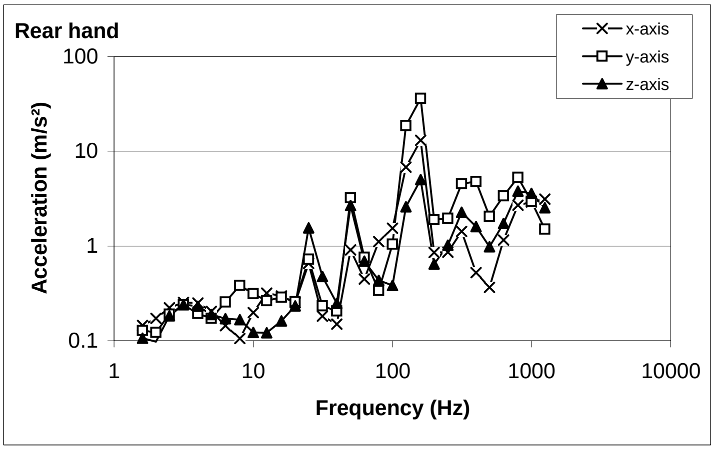
Notes:

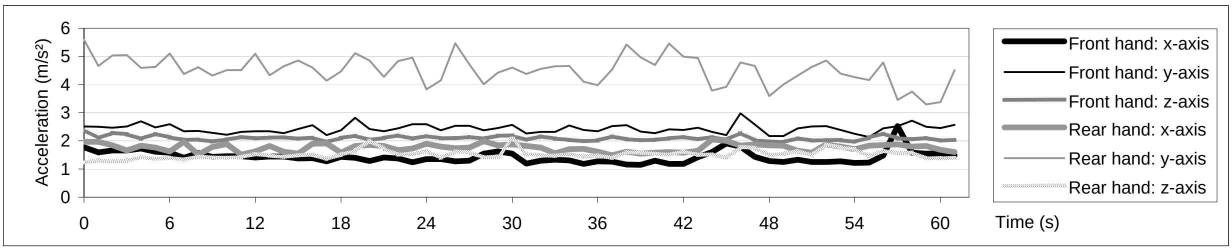
DC-shift threshold: 10 mm

MachineManufacturer: [redacted]
MachineModel:
HSLAnonymisedToolLetter: Machine B
MachineModifications:
MachineSize: 600mm blade
MainID: 1384
MachineWeight(kg): 5.7
ResultsID: 9999
MachineOperating pressure:
MachineSpeed(impacts/min):
MachineSpeed(revs/min):
MachinePower:
MachinePower source: 2 stroke oil mix
MeasurementTime: 62.5 Seconds
NumShotsInMeas:
InsertedTool:
DailyExposureTime:
InsertedToolType:
A(8) Front hand m/s²
InsertedToolManufacturer: [redacted]

	Front hand			Rear hand		
Frequency	x-axis	y-axis	z-axis	x-axis	y-axis	z-axis
1.6	0.163	0.114	0.235	0.146	0.129	0.106
2	0.169	0.128	0.139	0.172	0.122	0.098
2.5	0.202	0.157	0.123	0.222	0.191	0.184
3.15	0.381	0.168	0.1	0.254	0.238	0.241
4	0.302	0.187	0.082	0.25	0.193	0.232
5	0.207	0.17	0.074	0.204	0.172	0.189
6.3	0.149	0.126	0.061	0.144	0.257	0.171
8	0.145	0.079	0.074	0.106	0.383	0.167
10	0.143	0.072	0.094	0.199	0.315	0.122
12.5	0.149	0.102	0.149	0.319	0.265	0.121
16	0.178	0.102	0.162	0.296	0.288	0.161
20	0.183	0.088	0.146	0.252	0.259	0.233
25	0.822	0.361	0.58	0.656	0.724	1.552
31.5	0.269	0.126	0.215	0.182	0.234	0.475
40	0.25	0.251	0.313	0.15	0.206	0.248
50	3.336	6.58	4.914	0.909	3.236	2.671
63	0.814	1.535	1.144	0.449	0.76	0.694
80	0.853	1.163	0.8	1.108	0.34	0.433
100	0.894	1.16	0.645	1.539	1.042	0.384
125	2.64	4.211	5.15	6.787	18.73	2.585
160	4.959	7.925	10.08	13.02	36.15	5.024
200	0.842	0.677	1.095	0.853	1.905	0.644
250	1.044	1.685	1.31	0.861	1.964	1.022
315	1.662	4.214	2.481	1.423	4.555	2.268
400	3.107	3.552	2.801	0.524	4.805	1.597
500	1.483	2.167	1.241	0.365	2.059	0.981
630	2.806	5.662	2.477	1.152	3.389	1.732
800	7.729	13.37	6.455	2.69	5.297	3.785
1000	10.48	12.07	13.5	2.913	2.951	3.586
1250	5.336	4.884	4.177	3.124	1.51	2.542
ahw	**1.473**	**2.458**	**2.112**	**1.8**	**4.6**	**1.6**
av		**3.6**			**5.1**	







MainID: 1384, ResultsID: 9999

Vibration Emission Test report - Full

Standard: BS EN ISO 10517:2009
N&V reference ID: Machine C Idling
Measurement File name:

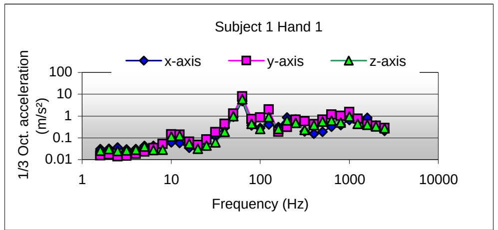
					Hand Position 1 - Support							Hand Position 2 - Throttle						
									Operator Statistics							Operator Statistics		
TestNo.	Operator	Meas. Name	Meas. Date	Meas Time	a_{whx}	a_{why}	a_{whz}	a_{hv}	Mean a_{hv}	S_{n-1}	C_v	a_{whx}	a_{why}	a_{whz}	a_{hv}	Mean a_{hv}	S_{n-1}	C_v
1	1	dle RH0	4/06/201	15:06:03:624	1.32	2.06	1.83	3.05				1.72	1.59	1.69	2.89			
2	1	dle RH0	4/06/201	15:07:23:499	1.07	2.48	1.55	3.12				1.99	1.42	1.79	3.04			
3	1	dle RH0	4/06/201	15:08:21:373	1.25	2.25	1.47	2.96	2.96	0.130	0.044	2.14	1.39	1.38	2.90	2.87	0.118	0.041
4	1	dle RH0	4/06/201	15:09:16:749	1.34	1.97	1.46	2.80				1.98	1.52	1.14	2.74			
5	1	dle RH1	4/06/201	15:10:14:498	1.43	1.93	1.57	2.87				1.90	1.53	1.30	2.77			
6	2	dle SH0	4/06/201	14:43:39:498	1.42	2.49	1.82	3.40				2.20	1.52	0.52	2.73			
7	2	dle SH0	4/06/201	14:44:43:248	0.79	2.71	1.56	3.22				3.76	1.57	0.88	4.17			
8	2	dle SH0	4/06/201	14:45:43:498	1.06	2.67	1.83	3.41	3.31	0.084	0.025	2.37	1.47	0.87	2.92	3.15	0.580	0.184
9	2	dle SH0	4/06/201	14:46:44:499	0.95	2.63	1.68	3.27				2.38	1.41	1.19	3.01			
10	2	dle SH0	4/06/201	14:47:38:999	0.94	2.57	1.78	3.26				2.36	1.33	1.10	2.92			
11	3	dle MM0	4/06/201	14:56:28:373	0.94	2.43	2.04	3.31				1.69	1.12	1.69	2.64			
12	3	dle MM0	4/06/201	14:57:42:748	1.24	2.03	1.81	2.98				1.45	1.45	1.33	2.44			
13	3	dle MM0	4/06/201	14:59:01:123	1.92	2.15	2.21	3.64	3.49	0.551	0.158	1.63	1.48	0.94	2.40	2.42	0.159	0.066
14	3	dle MM0	4/06/201	15:00:02:499	1.75	3.38	2.18	4.38				1.46	1.32	0.97	2.19			
15	3	dle MM0	4/06/201	15:01:03:124	1.66	2.11	1.67	3.16				1.49	1.36	1.32	2.41			

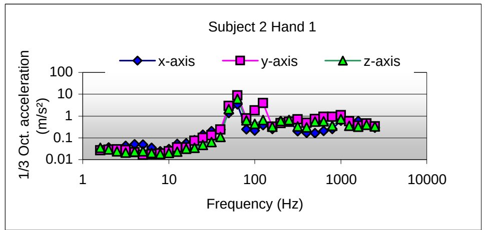
	Hand Position 1 - Support			Hand Position 2 - Throttle		
a_h (overall mean a_{hv}) :	3.26	m/s²	a_h (overall mean a_{hv}):	2.81	m/s²
$\sigma_{R(\text{single m/c.})}$:	0.46	m/s²	$\sigma_{R(\text{single m/c.})}$:	0.54	m/s²
$K_{(\text{single m/c.})}$ value:	0.76	m/s²	$K_{(\text{single m/c.})}$ value:	0.88	m/s²

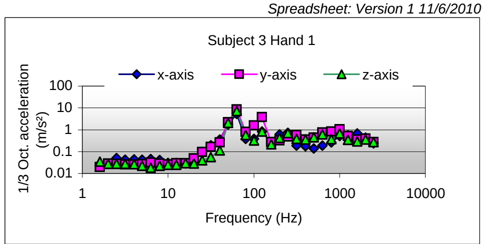
Single machine declared emission a_{hd} (= greatest a_h value)**: 3.26 m/s²** **$K_{(\text{single m/c.})}$ value: 0.76 m/s²**

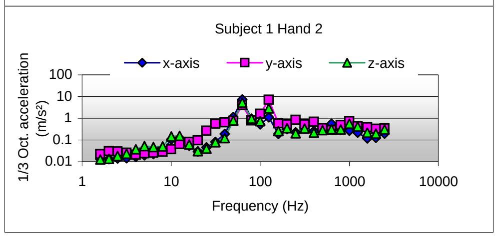
Pulse file version: Hedge trimmer emission - Dual triggered averaging time V1.0 2010-06-11.pls

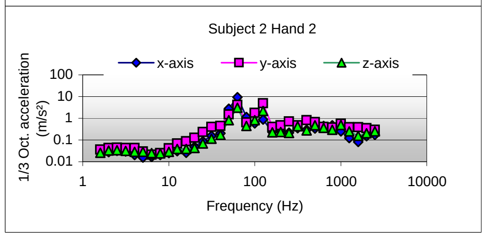
Spreadsheet: Version 1 11/6/2010

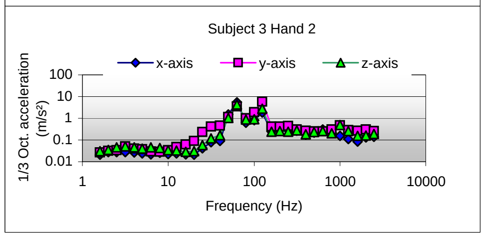












Vibration Emission Test report - Full

Standard: BS EN ISO 10517:2009
N&V reference ID: Machine C Racing
Measurement File name:

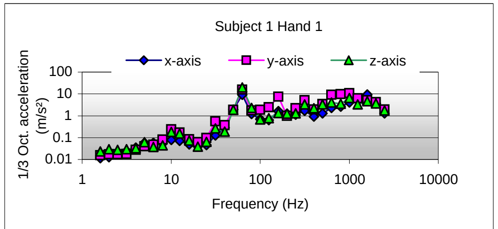
					Hand Position 1 - Support							Hand Position 2 - Throttle						
									Operator Statistics							Operator Statistics		
TestNo.	Operator	Meas. Name	Meas. Date	Meas Time	a_{whx}	a_{why}	a_{whz}	a_{hv}	Mean a_{hv}	S_{n-1}	C_v	a_{whx}	a_{why}	a_{whz}	a_{hv}	Mean a_{hv}	S_{n-1}	C_v
1	1	cing RH	4/06/201	15:06:41:999	2.59	4.32	5.46	7.43				2.47	3.70	2.46	5.08			
2	1	cing RH	4/06/201	15:07:54:498	2.45	3.85	5.12	6.86				2.71	3.73	2.31	5.15			
3	1	cing RH	4/06/201	15:08:51:748	2.37	4.35	5.21	7.19	7.06	0.276	0.039	2.47	3.48	2.29	4.85	5.06	0.123	0.024
4	1	cing RH	4/06/201	15:09:45:998	2.31	4.18	4.73	6.73				2.76	3.79	2.08	5.13			
5	1	cing RH	4/06/201	15:10:41:498	2.55	4.55	4.81	7.10				2.66	3.70	2.31	5.11			
6	2	cing SH	4/06/201	14:44:13:749	1.14	5.36	5.07	7.46				1.34	3.41	1.89	4.12			
7	2	cing SH	4/06/201	14:45:15:374	1.10	4.42	5.68	7.28				0.94	3.95	1.99	4.52			
8	2	cing SH	4/06/201	14:46:17:123	1.13	4.98	5.58	7.56	7.59	0.243	0.032	1.18	3.99	2.01	4.62	4.52	0.227	0.050
9	2	cing SH	4/06/201	14:47:12:248	1.37	4.66	6.26	7.92				1.17	3.96	2.22	4.68			
10	2	cing SH	4/06/201	14:48:05:999	1.12	4.97	5.78	7.71				1.05	3.97	2.15	4.63			
11	3	cing MM	4/06/201	14:57:13:624	3.22	3.41	7.04	8.46				2.04	3.79	2.75	5.10			
12	3	cing MM	4/06/201	14:58:31:624	3.65	3.11	7.69	9.06				2.07	4.05	2.41	5.14			
13	3	cing MM	4/06/201	14:59:33:248	2.99	3.38	6.63	8.02	8.51	0.587	0.069	2.36	3.40	2.08	4.63	4.89	0.284	0.058
14	3	cing MM	4/06/201	15:00:35:999	2.99	4.11	7.63	9.16				2.14	3.34	2.21	4.54			
15	3	cing MM	4/06/201	15:01:30:249	3.05	3.88	6.13	7.87				2.48	3.87	2.08	5.05			

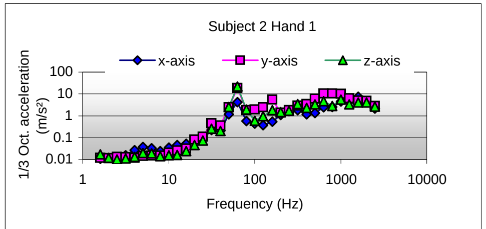
	Hand Position 1 - Support			Hand Position 2 - Throttle		
a_h (overall mean a_{hv}) :	7.72	m/s²	a_h (overall mean a_{hv}):	4.82	m/s²
$\sigma_{R(single\ m/c.)}$:	0.81	m/s²	$\sigma_{R(single\ m/c.)}$:	0.38	m/s²
$K_{(single\ m/c.)}$ value:	1.34	m/s²	$K_{(single\ m/c.)}$ value:	0.62	m/s²

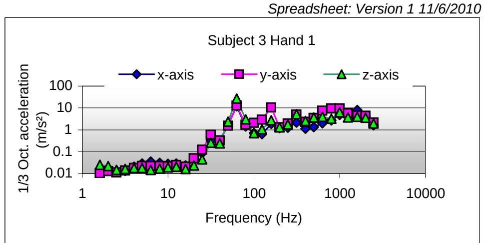
Single machine declared emission a_{hd} (= greatest a_h value): 7.72 m/s² **$K_{(single\ m/c.)}$ value: 1.34 m/s²**

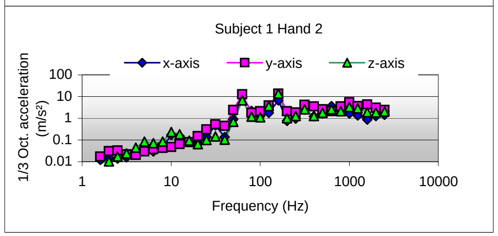
Pulse file version: Hedge trimmer emission - Dual triggered averaging time V1.0 2010-06-11.pls

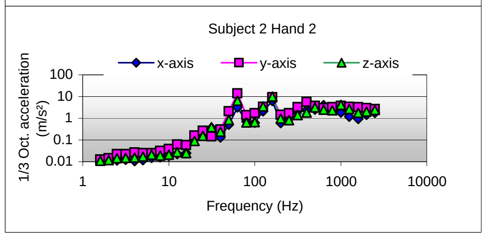
Spreadsheet: Version 1 11/6/2010

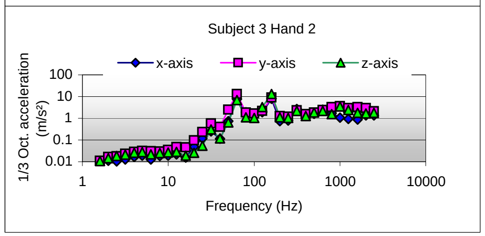












LocationName:

Occupation: Grounds Maintenance
Process: Cutting thick shrub
RecordDate: October 20, 2010

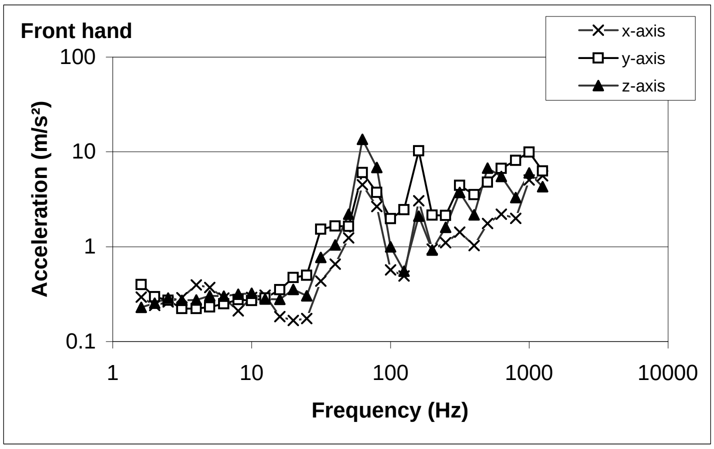
TapeNumber: N/A
Operator#: OP#1
Horizontal operation
VideoNumber: N/A

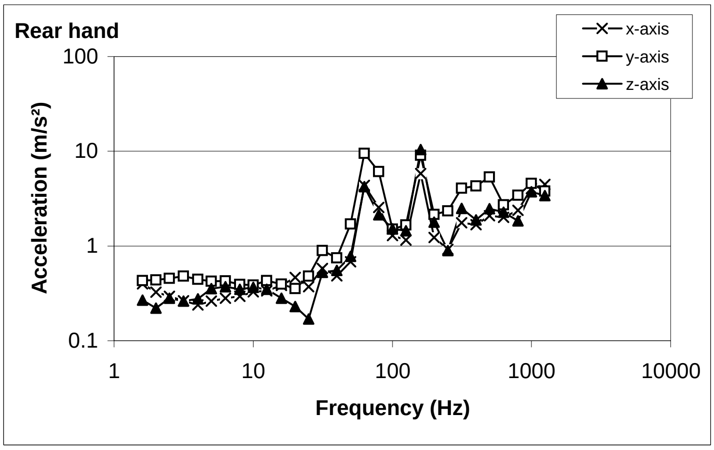
Notes:

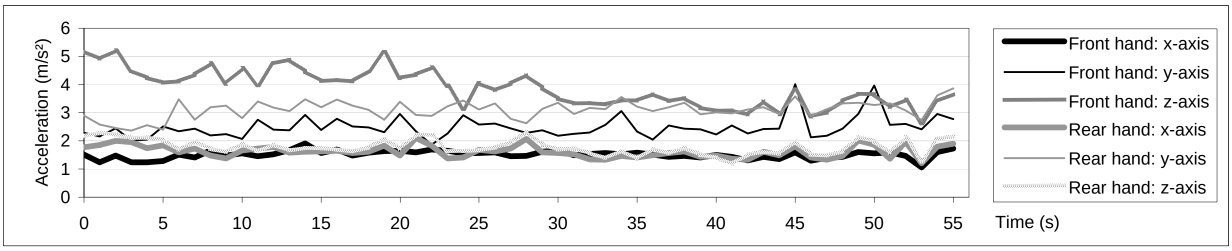
DC-shift threshold: 10 mm

MachineManufacturer:
MachineModel:
HSLAnonymisedToolLetter: Machine C
MachineModifications:
MachineSize: 600mm blade
MainID: 1385
MachineWeight(kg): 6
ResultsID: 10000
MachineOperating pressure:
MachineSpeed(impacts/min):
MachineSpeed(revs/min):
MachinePower:
MachinePower source: 2 stroke oil mix
MeasurementTime: 56.75 Seconds
NumShotsInMeas:
InsertedTool:
DailyExposureTime:
InsertedToolType:
A(8) Front hand m/s²
InsertedToolManufacturer:

	Front hand			Rear hand		
Frequency	x-axis	y-axis	z-axis	x-axis	y-axis	z-axis
1.6	0.295	0.399	0.229	0.399	0.432	0.268
2	0.241	0.296	0.254	0.326	0.436	0.221
2.5	0.262	0.273	0.289	0.294	0.455	0.28
3.15	0.29	0.222	0.273	0.264	0.481	0.262
4	0.395	0.222	0.275	0.239	0.443	0.277
5	0.372	0.232	0.304	0.263	0.423	0.356
6.3	0.287	0.251	0.302	0.282	0.427	0.372
8	0.211	0.276	0.315	0.294	0.391	0.35
10	0.291	0.27	0.322	0.329	0.387	0.366
12.5	0.308	0.287	0.281	0.335	0.431	0.348
16	0.183	0.353	0.279	0.384	0.397	0.28
20	0.168	0.474	0.355	0.466	0.356	0.229
25	0.175	0.5	0.304	0.373	0.482	0.17
31.5	0.436	1.532	0.77	0.578	0.892	0.526
40	0.656	1.655	1.042	0.486	0.749	0.554
50	1.241	1.638	2.204	0.679	1.707	0.778
63	4.519	6.052	13.6	4.35	9.466	4.238
80	2.648	3.736	6.825	2.549	6.11	2.132
100	0.57	1.979	0.994	1.286	1.507	1.518
125	0.493	2.458	0.555	1.161	1.663	1.452
160	3.064	10.29	2.102	5.808	9.064	10.43
200	0.944	2.16	0.926	1.235	2.145	1.782
250	1.105	2.128	1.597	0.922	2.353	0.896
315	1.425	4.422	3.729	1.754	4.062	2.489
400	1.029	3.546	2.174	1.68	4.3	1.888
500	1.759	4.78	6.741	2.09	5.346	2.481
630	2.198	6.717	5.523	2.008	2.717	2.266
800	1.985	8.145	3.297	2.378	3.424	1.841
1000	5.057	9.951	5.984	4.031	4.575	3.725
1250	5.578	6.292	4.306	4.459	3.806	3.408
ahw	**1.556**	**2.537**	**3.95**	**1.7**	**3.2**	**1.8**
av		**4.9**			**4.0**	



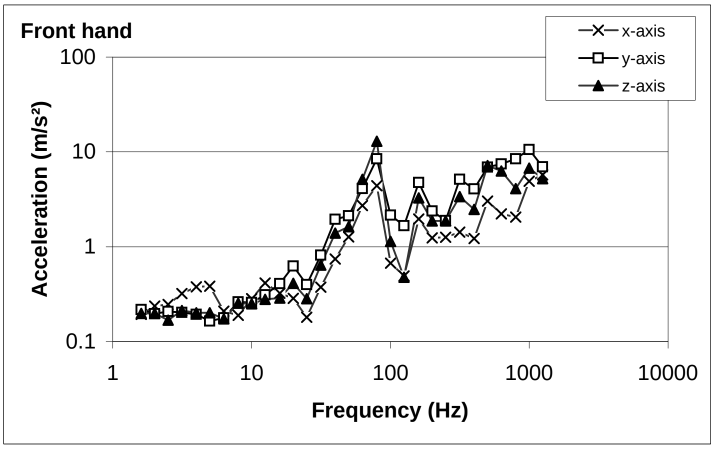


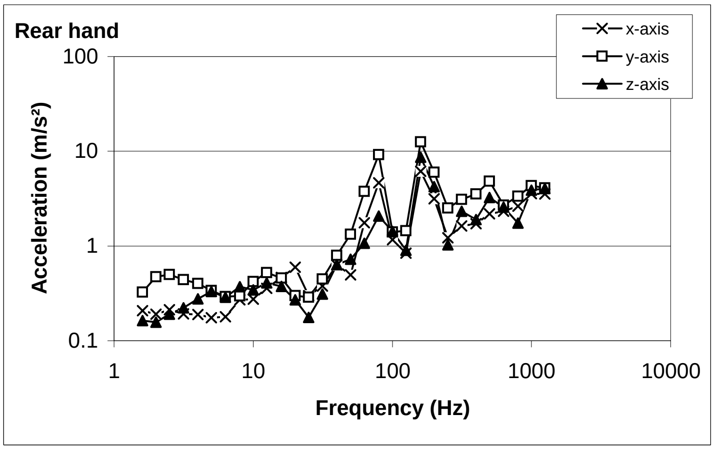


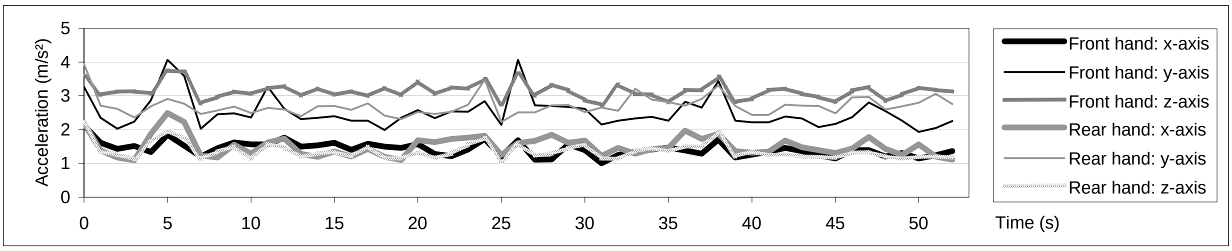
MainID: 1385, ResultsID: 10000

LocationName:		MachineManufacturer:	
		MachineModel:	
Occupation:	Grounds Maintenance	HSLAnonymisedToolLetter:	Machine C
Process:	Cutting thick shrub	MachineModifications:	
RecordDate:	October 20, 2010	MachineSize:	600mm blade
		MainID:	1385
		MachineWeight(kg):	6
		ResultsID:	10001
TapeNumber:	N/A	MachineOperating pressure:	
Operator#:	OP#2	MachineSpeed(impacts/min):	
	Horizontal operation	MachineSpeed(revs/min):	
VideoNumber:	N/A	MachinePower:	
		MachinePower source:	2 stroke oil mix
		MeasurementTime:	53.75 Seconds
Notes:		NumShotsInMeas:	
		InsertedTool:	
		DailyExposureTime:	
DC-shift threshold:	*10 mm*	InsertedToolType:	
		A(8) Front hand	m/s²
		InsertedToolManufacturer:	

	Front hand			Rear hand		
Frequency	x-axis	y-axis	z-axis	x-axis	y-axis	z-axis
1.6	0.193	0.217	0.198	0.208	0.325	0.163
2	0.236	0.196	0.198	0.191	0.473	0.157
2.5	0.246	0.208	0.168	0.213	0.501	0.191
3.15	0.32	0.203	0.212	0.192	0.44	0.223
4	0.377	0.194	0.202	0.189	0.403	0.277
5	0.384	0.164	0.202	0.175	0.338	0.332
6.3	0.209	0.178	0.173	0.179	0.292	0.289
8	0.189	0.262	0.254	0.27	0.297	0.371
10	0.283	0.258	0.25	0.275	0.421	0.344
12.5	0.414	0.311	0.279	0.358	0.524	0.408
16	0.322	0.408	0.288	0.464	0.458	0.375
20	0.286	0.624	0.41	0.595	0.3	0.271
25	0.18	0.398	0.282	0.3	0.289	0.176
31.5	0.376	0.813	0.643	0.379	0.45	0.311
40	0.743	1.953	1.394	0.63	0.794	0.635
50	1.27	2.113	1.627	0.498	1.325	0.724
63	2.722	4.098	5.137	1.757	3.761	1.069
80	4.409	8.466	12.99	4.654	9.174	2.07
100	0.673	2.149	1.135	1.168	1.406	1.423
125	0.49	1.668	0.479	0.843	1.443	0.9
160	1.959	4.748	3.281	6.157	12.51	8.659
200	1.241	2.378	1.873	3.144	6.025	4.217
250	1.26	1.893	1.865	1.217	2.514	1.027
315	1.43	5.157	3.381	1.622	3.107	2.331
400	1.217	4.062	2.473	1.719	3.534	1.898
500	3.019	6.919	7.181	2.183	4.838	3.257
630	2.221	7.439	6.278	2.333	2.687	2.578
800	2.056	8.437	4.099	2.637	3.342	1.745
1000	4.909	10.61	6.756	3.572	4.346	3.875
1250	5.729	6.975	5.232	3.546	4.088	4.038
ahw	**1.477**	**2.582**	**3.176**	**1.6**	**2.8**	**1.4**
av		**4.4**			**3.5**	



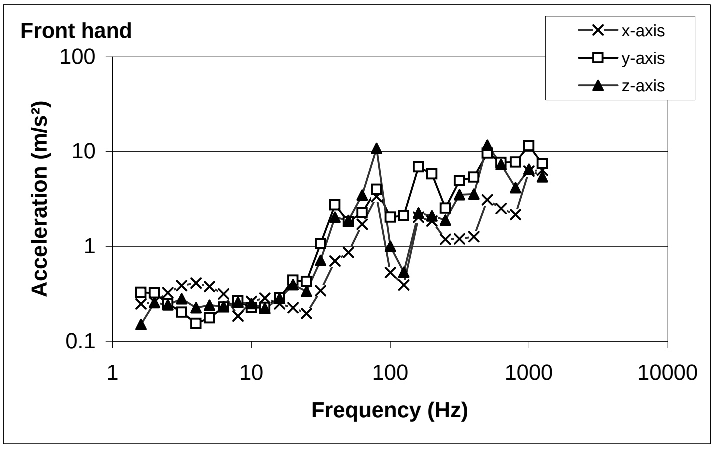


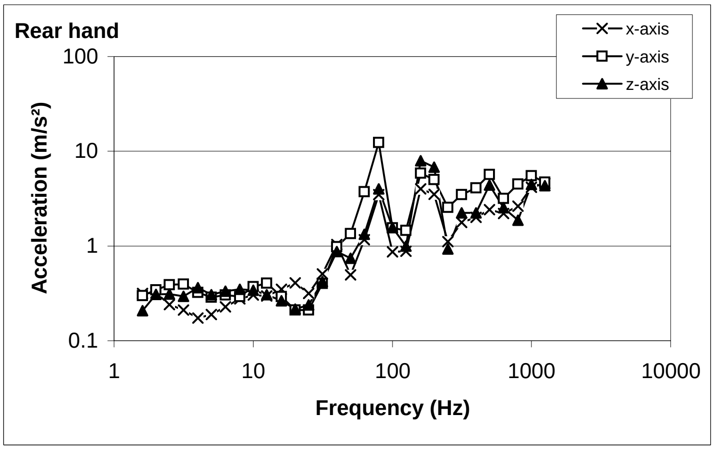


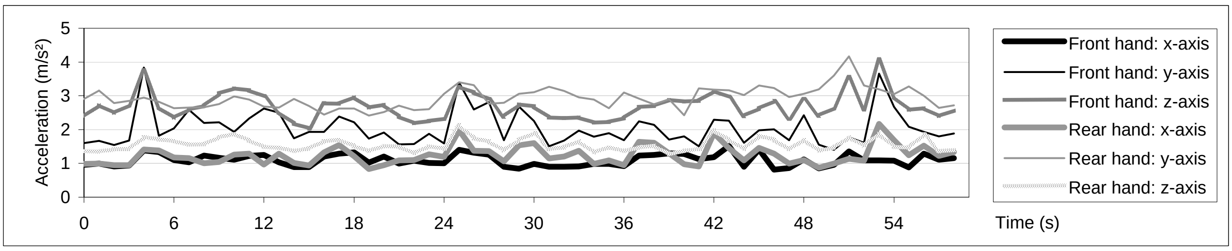
MainID: 1385, ResultsID: 10001

LocationName:		MachineManufacturer:			
		MachineModel:			
Occupation:	Grounds Maintenance			HSLAnonymisedToolLetter:	Machine C
Process:	Cutting thick shrub	MachineModifications:			
RecordDate:	October 20, 2010	MachineSize:	600mm blade	MainID:	1385
		MachineWeight(kg):	6	ResultsID:	10002
TapeNumber:	N/A	MachineOperating pressure:			
Operator#:	OP#3	MachineSpeed(impacts/min):			
	Horizontal operation	MachineSpeed(revs/min):			
VideoNumber:	N/A	MachinePower:			
		MachinePower source:	2 stroke oil mix	MeasurementTime:	59.25 Seconds
Notes:				NumShotsInMeas:	
		InsertedTool:		DailyExposureTime:	
DC-shift threshold:	*10 mm*	InsertedToolType:		A(8) Front hand	m/s²
		InsertedToolManufacturer:			

	Front hand			Rear hand		
Frequency	x-axis	y-axis	z-axis	x-axis	y-axis	z-axis
1.6	0.249	0.327	0.151	0.315	0.3	0.208
2	0.26	0.323	0.256	0.321	0.343	0.308
2.5	0.326	0.249	0.243	0.241	0.388	0.31
3.15	0.387	0.203	0.282	0.211	0.397	0.294
4	0.412	0.154	0.226	0.173	0.323	0.362
5	0.377	0.177	0.241	0.189	0.288	0.307
6.3	0.315	0.229	0.234	0.227	0.303	0.335
8	0.185	0.266	0.259	0.276	0.293	0.349
10	0.263	0.226	0.251	0.305	0.373	0.34
12.5	0.286	0.228	0.223	0.296	0.404	0.307
16	0.247	0.288	0.283	0.349	0.292	0.264
20	0.226	0.44	0.395	0.407	0.212	0.216
25	0.196	0.427	0.335	0.317	0.212	0.239
31.5	0.341	1.072	0.715	0.506	0.403	0.421
40	0.702	2.743	2.046	1.037	0.979	0.875
50	0.87	1.836	1.889	0.497	1.354	0.741
63	1.713	2.266	3.492	1.168	3.74	1.33
80	3.342	4.007	10.8	3.495	12.41	3.996
100	0.532	2.04	1.006	0.867	1.555	1.571
125	0.393	2.117	0.537	0.879	1.463	0.999
160	2.035	6.891	2.26	3.998	5.866	7.922
200	1.862	5.826	2.105	3.525	5.014	6.808
250	1.193	2.543	1.899	1.112	2.552	0.929
315	1.206	4.944	3.522	1.77	3.484	2.235
400	1.264	5.374	3.56	2.011	4.09	2.239
500	3.108	9.636	11.69	2.424	5.691	4.412
630	2.506	7.684	7.366	2.203	3.179	2.537
800	2.165	7.788	4.152	2.628	4.491	1.869
1000	6.258	11.54	6.52	4.161	5.512	4.468
1250	6.389	7.451	5.42	4.591	4.708	4.34
ahw	**1.16**	**2.138**	**2.753**	**1.3**	**3.0**	**1.6**
av		**3.7**			**3.6**	



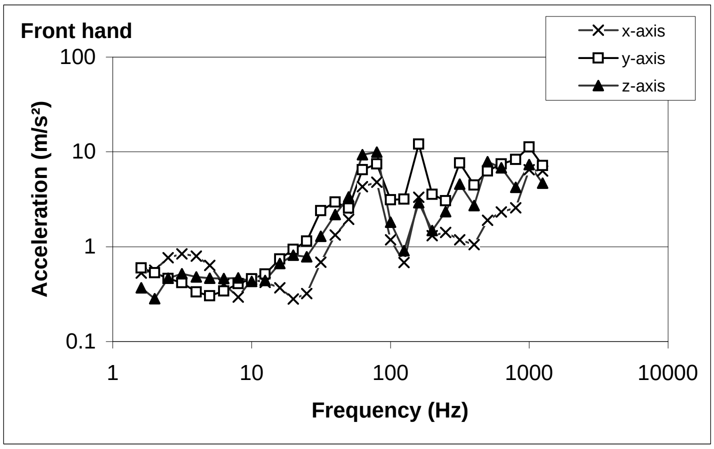


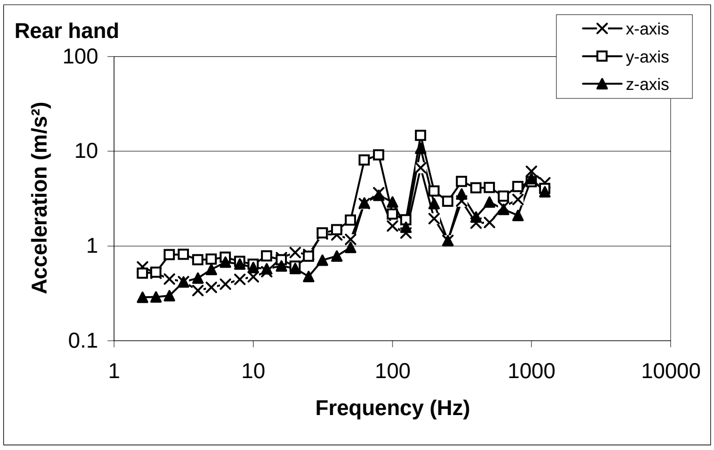


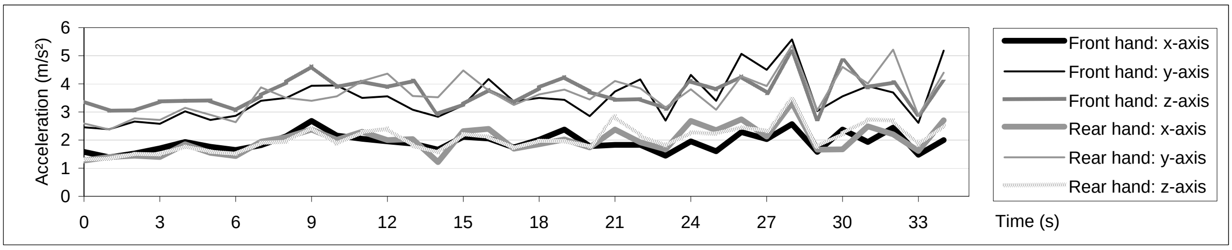
MainID: 1385, ResultsID: 10002

LocationName:		MachineManufacturer:			
		MachineModel:			
Occupation:	Grounds Maintenance			HSLAnonymisedToolLetter:	Machine C
Process:	Cutting thin shrub	MachineModifications:			
RecordDate:	October 20, 2010	MachineSize:	600mm blade	MainID:	1386
		MachineWeight(kg):	6	ResultsID:	10003
TapeNumber:	N/A	MachineOperating pressure:			
Operator#:	OP#1	MachineSpeed(impacts/min):			
	Horizontal operation	MachineSpeed(revs/min):			
VideoNumber:	N/A	MachinePower:			
		MachinePower source:	2 stroke oil mix	MeasurementTime:	35.5 Seconds
Notes:				NumShotsInMeas:	
		InsertedTool:		DailyExposureTime:	
DC-shift threshold:	*10 mm*	InsertedToolType:		A(8) Front hand	m/s²
		InsertedToolManufacturer:			

	Front hand			Rear hand		
Frequency	x-axis	y-axis	z-axis	x-axis	y-axis	z-axis
1.6	0.529	0.595	0.37	0.603	0.517	0.288
2	0.566	0.53	0.283	0.515	0.529	0.289
2.5	0.768	0.463	0.465	0.448	0.809	0.299
3.15	0.839	0.417	0.521	0.421	0.814	0.418
4	0.797	0.333	0.481	0.34	0.716	0.458
5	0.636	0.305	0.466	0.365	0.727	0.564
6.3	0.405	0.342	0.462	0.397	0.758	0.674
8	0.294	0.409	0.469	0.443	0.689	0.648
10	0.453	0.458	0.431	0.474	0.639	0.594
12.5	0.421	0.517	0.44	0.536	0.782	0.575
16	0.368	0.74	0.667	0.754	0.712	0.615
20	0.281	0.934	0.812	0.852	0.613	0.581
25	0.32	1.143	0.783	0.817	0.78	0.475
31.5	0.688	2.407	1.29	1.341	1.37	0.709
40	1.33	2.964	2.195	1.307	1.481	0.782
50	1.949	2.553	3.354	1.172	1.873	0.963
63	4.307	6.506	9.325	2.801	8.05	2.854
80	4.806	7.452	9.973	3.663	9.112	3.444
100	1.18	3.136	1.811	1.621	2.17	2.907
125	0.684	3.171	0.906	1.372	1.892	1.58
160	3.324	12.11	2.903	6.684	14.71	10.79
200	1.304	3.557	1.478	1.95	3.807	2.814
250	1.41	3.045	2.337	1.147	2.949	1.143
315	1.18	7.616	4.58	2.986	4.793	3.535
400	1.057	4.466	2.721	1.747	4.114	2.022
500	1.897	6.295	7.89	1.769	4.129	2.918
630	2.318	7.447	6.793	2.591	3.35	2.447
800	2.568	8.315	4.231	3.097	4.228	2.096
1000	6.499	11.3	7.351	6.15	4.745	5.154
1250	6.284	7.204	4.669	4.651	4.027	3.73
ahw	**2.039**	**3.649**	**3.792**	**2.1**	**3.8**	**2.2**
av		**5.6**			**4.9**	







MainID: 1386, ResultsID: 10003

LocationName: [redacted]

Occupation: Grounds Maintenance
Process: Cutting thin shrub
RecordDate: October 20, 2010

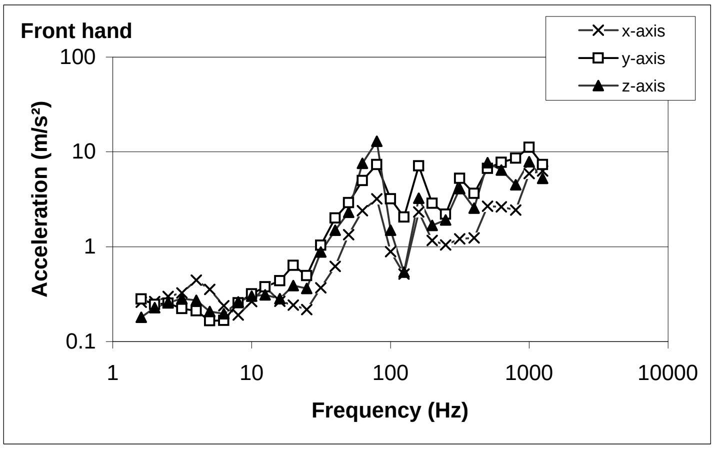
TapeNumber: N/A
Operator#: OP#2
Horizontal operation
VideoNumber: N/A

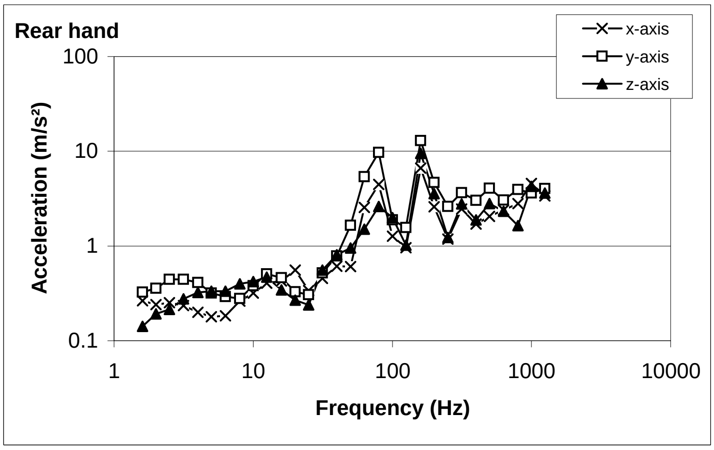
Notes:

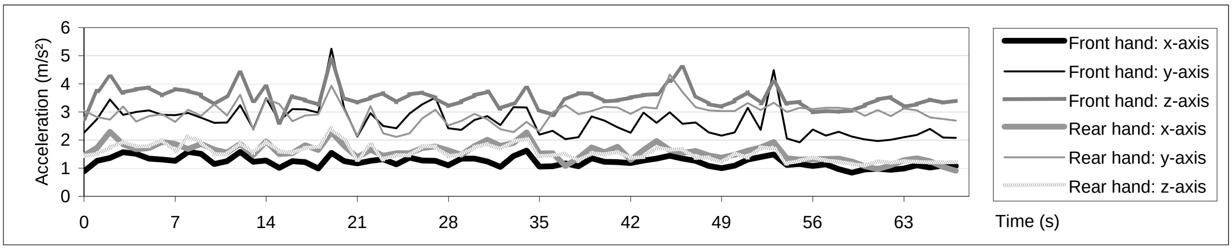
DC-shift threshold: 10 mm

MachineManufacturer: [redacted]
MachineModel:
HSLAnonymisedToolLetter: Machine C
MachineModifications:
MachineSize: 600mm blade
MainID: 1386
MachineWeight(kg): 6
ResultsID: 10004
MachineOperating pressure:
MachineSpeed(impacts/min):
MachineSpeed(revs/min):
MachinePower:
MachinePower source: 2 stroke oil mix
MeasurementTime: 68 Seconds
NumShotsInMeas:
InsertedTool:
DailyExposureTime:
InsertedToolType:
A(8) Front hand m/s²
InsertedToolManufacturer: [redacted]

	Front hand			Rear hand		
Frequency	x-axis	y-axis	z-axis	x-axis	y-axis	z-axis
1.6	0.261	0.282	0.181	0.263	0.326	0.142
2	0.263	0.246	0.228	0.241	0.356	0.192
2.5	0.3	0.254	0.258	0.253	0.444	0.214
3.15	0.325	0.223	0.282	0.234	0.445	0.277
4	0.446	0.21	0.273	0.199	0.41	0.324
5	0.354	0.166	0.207	0.18	0.317	0.334
6.3	0.238	0.167	0.196	0.183	0.293	0.334
8	0.191	0.256	0.262	0.263	0.278	0.4
10	0.264	0.318	0.302	0.317	0.38	0.422
12.5	0.378	0.379	0.312	0.406	0.506	0.469
16	0.267	0.439	0.283	0.427	0.464	0.343
20	0.242	0.636	0.388	0.555	0.328	0.267
25	0.218	0.495	0.362	0.339	0.307	0.238
31.5	0.368	1.04	0.878	0.456	0.52	0.558
40	0.619	2.011	1.495	0.611	0.784	0.812
50	1.342	2.908	2.312	0.608	1.653	0.949
63	2.399	4.965	7.586	2.551	5.393	1.51
80	3.189	7.319	13	4.459	9.725	2.622
100	0.885	3.207	1.492	1.266	1.887	1.989
125	0.516	2.047	0.54	0.958	1.569	1.021
160	2.323	7.139	3.241	6.649	12.96	9.486
200	1.168	2.863	1.684	2.603	4.69	3.564
250	1.042	2.21	1.915	1.183	2.624	1.228
315	1.213	5.252	4.091	2.465	3.654	2.784
400	1.235	3.653	2.545	1.709	3.021	1.879
500	2.675	6.702	7.698	2.048	4.086	2.803
630	2.627	7.783	6.452	2.394	3.061	2.326
800	2.436	8.599	4.486	2.808	3.936	1.636
1000	5.897	11.19	7.89	4.564	3.609	4.252
1250	6.277	7.354	5.254	3.383	4.037	3.614
ahw	**1.282**	**2.762**	**3.563**	**1.6**	**3.0**	**1.6**
av		**4.7**			**3.8**	



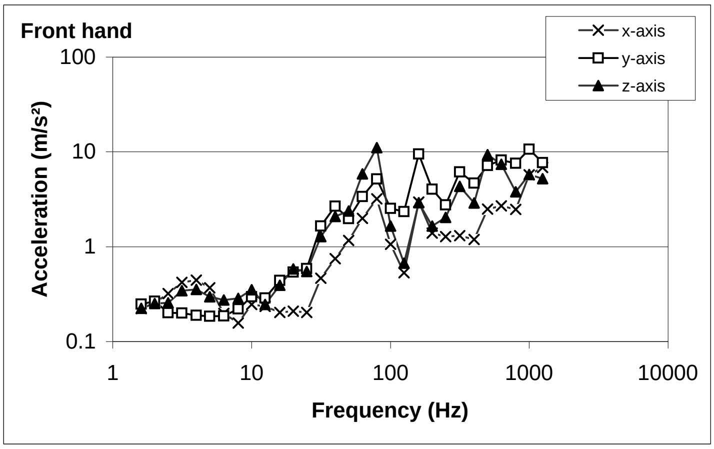


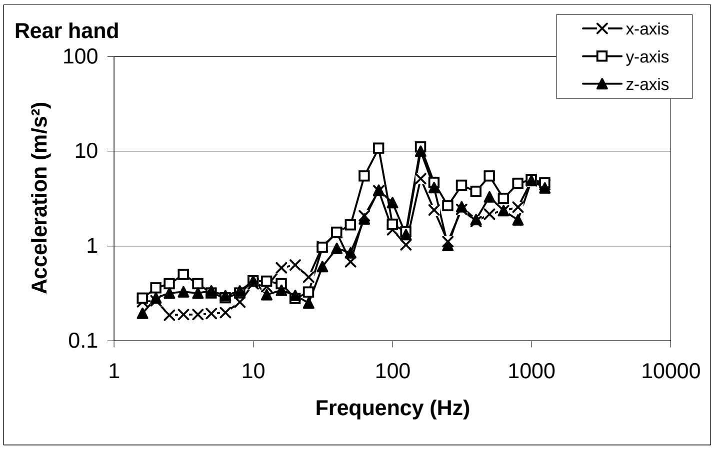


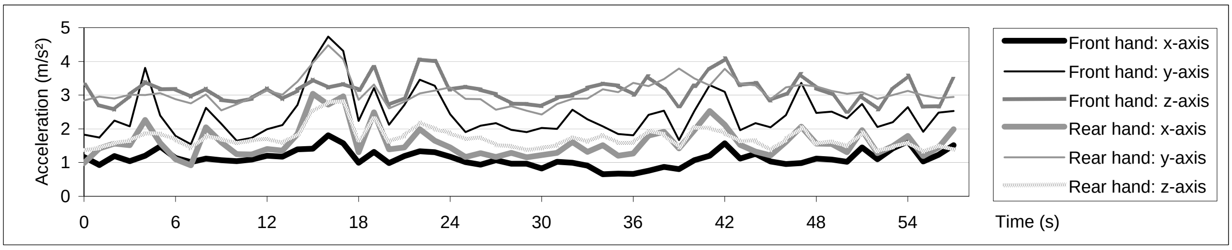
MainID: 1386, ResultsID: 10004

LocationName:	[redacted]	MachineManufacturer:	[redacted]		
		MachineModel:			
Occupation:	Grounds Maintenance			HSLAnonymisedToolLetter:	Machine C
Process:	Cutting thin shrub	MachineModifications:			
RecordDate:	October 20, 2010	MachineSize:	600mm blade	MainID:	1386
		MachineWeight(kg):	6	ResultsID:	10005
TapeNumber:	N/A	MachineOperating pressure:			
Operator#:	OP#3	MachineSpeed(impacts/min):			
	Horizontal operation	MachineSpeed(revs/min):			
VideoNumber:	N/A	MachinePower:			
		MachinePower source:	2 stroke oil mix	MeasurementTime:	58.5 Seconds
Notes:				NumShotsInMeas:	
		InsertedTool:		DailyExposureTime:	
DC-shift threshold:	*10 mm*	InsertedToolType:		A(8) Front hand	m/s²
		InsertedToolManufacturer:	[redacted]		

	Front hand			Rear hand		
Frequency	x-axis	y-axis	z-axis	x-axis	y-axis	z-axis
1.6	0.223	0.248	0.224	0.259	0.281	0.196
2	0.255	0.265	0.252	0.263	0.36	0.282
2.5	0.321	0.202	0.257	0.187	0.398	0.318
3.15	0.422	0.2	0.344	0.189	0.499	0.329
4	0.446	0.189	0.355	0.189	0.397	0.319
5	0.369	0.185	0.298	0.194	0.318	0.336
6.3	0.199	0.187	0.275	0.197	0.283	0.3
8	0.157	0.221	0.286	0.257	0.319	0.336
10	0.247	0.297	0.352	0.4	0.428	0.428
12.5	0.236	0.287	0.247	0.373	0.426	0.305
16	0.203	0.442	0.394	0.587	0.399	0.342
20	0.21	0.541	0.584	0.632	0.28	0.302
25	0.203	0.587	0.548	0.47	0.326	0.25
31.5	0.465	1.649	1.278	0.99	0.968	0.608
40	0.75	2.686	2.088	1.383	1.388	0.945
50	1.164	1.972	2.39	0.679	1.665	0.85
63	1.987	3.369	5.848	2.084	5.455	1.934
80	3.188	5.171	11.08	3.814	10.77	3.877
100	1.058	2.539	1.651	1.484	1.689	2.874
125	0.533	2.352	0.67	1.026	1.417	1.317
160	2.952	9.527	2.916	5.123	11.09	9.988
200	1.389	4.053	1.657	2.391	4.674	4.129
250	1.28	2.753	2.033	1.109	2.647	1.013
315	1.31	6.133	4.347	2.433	4.362	2.586
400	1.19	4.667	2.892	1.818	3.779	1.907
500	2.487	7.183	9.315	2.176	5.489	3.303
630	2.705	8.168	7.423	2.359	3.172	2.354
800	2.466	7.603	3.793	2.566	4.579	1.886
1000	5.738	10.68	5.754	4.876	5.02	4.914
1250	6.826	7.671	5.208	4.448	4.645	4.088
ahw	**1.202**	**2.547**	**3.198**	**1.7**	**3.2**	**1.8**
av		**4.3**			**4.0**	



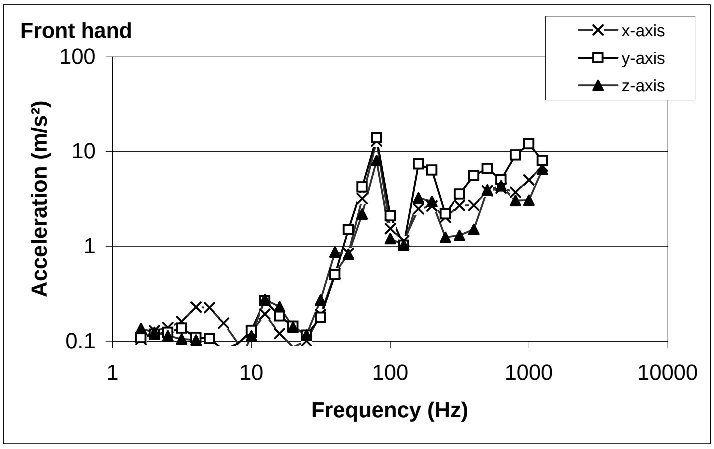


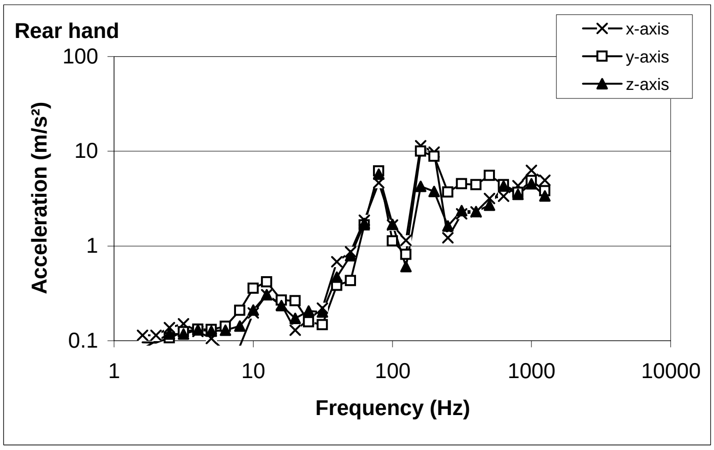


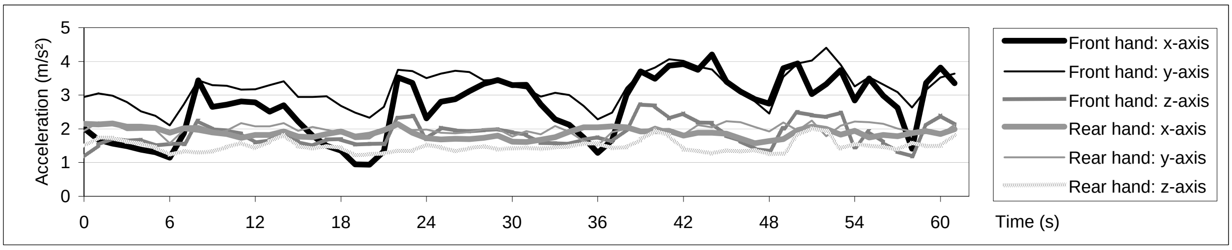
MainID: 1386, ResultsID: 10005

LocationName:	[redacted]	MachineManufacturer: MachineModel:	[redacted]	
Occupation:	Grounds Maintenance		HSLAnonymisedToolLetter:	Machine C
Process:	Cutting conifer	MachineModifications:		
RecordDate:	October 20, 2010	MachineSize: 600mm blade	MainID:	1387
		MachineWeight(kg): 6	ResultsID:	10007
TapeNumber:	N/A	MachineOperating pressure:		
Operator#:	OP#1	MachineSpeed(impacts/min):		
	Vertical operation	MachineSpeed(revs/min):		
VideoNumber:	N/A	MachinePower:		
		MachinePower source: 2 stroke oil mix	MeasurementTime:	62 Seconds
Notes:			NumShotsInMeas:	
		InsertedTool:	DailyExposureTime:	
DC-shift threshold:	*10 mm*	InsertedToolType:	A(8) Front hand	m/s²
		InsertedToolManufacturer: [redacted]		

	Front hand			Rear hand		
Frequency	x-axis	y-axis	z-axis	x-axis	y-axis	z-axis
1.6	0.105	0.109	0.136	0.114	0.096	0.082
2	0.129	0.119	0.124	0.114	0.095	0.099
2.5	0.139	0.124	0.114	0.138	0.108	0.117
3.15	0.162	0.138	0.106	0.151	0.124	0.118
4	0.23	0.11	0.103	0.125	0.132	0.13
5	0.227	0.107	0.071	0.106	0.131	0.126
6.3	0.156	0.081	0.057	0.076	0.142	0.129
8	0.096	0.095	0.056	0.088	0.209	0.143
10	0.124	0.13	0.114	0.196	0.356	0.211
12.5	0.193	0.267	0.278	0.306	0.419	0.306
16	0.121	0.185	0.232	0.241	0.269	0.235
20	0.087	0.144	0.141	0.129	0.264	0.172
25	0.101	0.116	0.116	0.166	0.158	0.206
31.5	0.192	0.18	0.273	0.221	0.148	0.201
40	0.518	0.504	0.872	0.679	0.383	0.469
50	0.847	1.51	0.827	0.87	0.43	0.792
63	3.196	4.217	2.199	1.868	1.67	1.729
80	12.92	13.97	8.069	4.635	6.203	5.715
100	1.54	2.097	1.211	1.666	1.13	1.692
125	1.146	1.026	1.038	1.15	0.813	0.606
160	2.486	7.414	3.249	11.48	10.02	4.254
200	2.679	6.392	2.975	9.821	8.85	3.755
250	2.046	2.211	1.252	1.217	3.714	1.624
315	2.717	3.563	1.308	2.184	4.535	2.364
400	2.71	5.619	1.513	2.293	4.419	2.311
500	3.845	6.651	3.955	3.165	5.542	2.699
630	4.134	5.049	4.366	3.346	4.432	4.296
800	3.735	9.2	3.045	4.344	3.679	3.502
1000	5.039	12.1	3.089	6.298	4.919	4.544
1250	7.059	8.054	6.479	4.962	3.836	3.379
ahw	**2.833**	**3.281**	**1.904**	**1.9**	**2.0**	**1.5**
av		**4.7**			**3.1**	



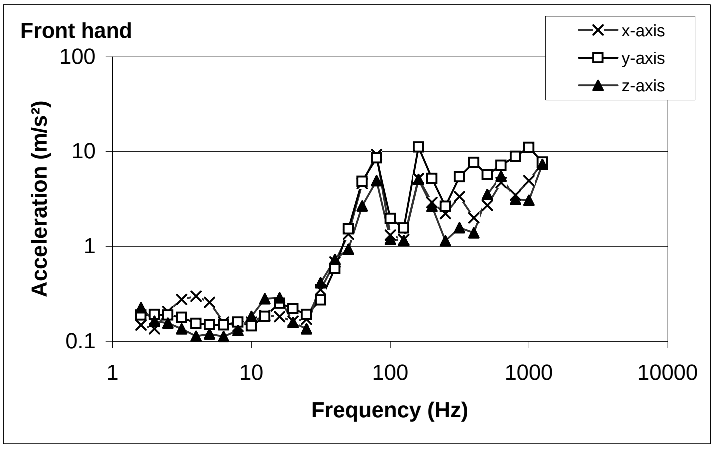


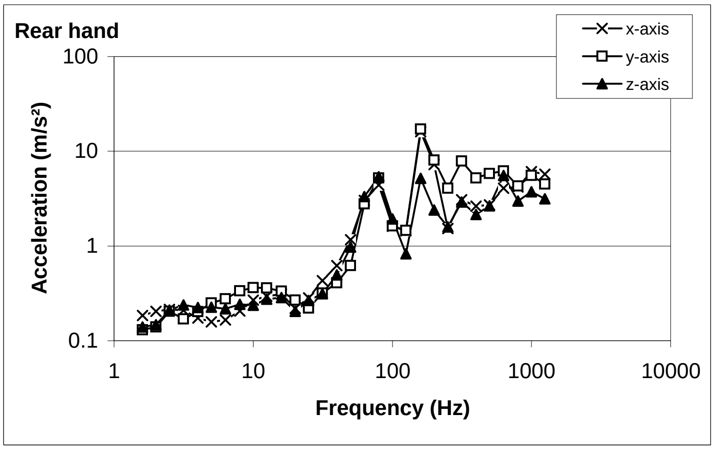


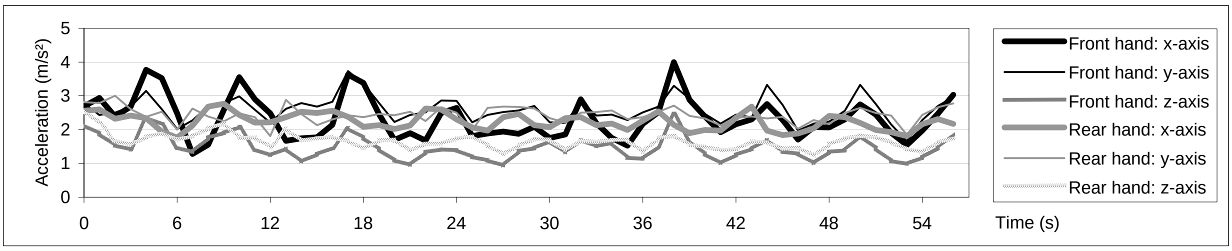
MainID: 1387, ResultsID: 10007

LocationName:		MachineManufacturer:			
		MachineModel:			
Occupation:	Grounds Maintenance			HSLAnonymisedToolLetter:	Machine C
Process:	Cutting conifer	MachineModifications:			
RecordDate:	October 20, 2010	MachineSize:	600mm blade	MainID:	1387
		MachineWeight(kg):	6	ResultsID:	10008
TapeNumber:	N/A	MachineOperating pressure:			
Operator#:	OP#2	MachineSpeed(impacts/min):			
	Vertical operation	MachineSpeed(revs/min):			
VideoNumber:	N/A	MachinePower:			
		MachinePower source:	2 stroke oil mix	MeasurementTime:	57 Seconds
Notes:				NumShotsInMeas:	
		InsertedTool:		DailyExposureTime:	
DC-shift threshold:	*10 mm*	InsertedToolType:		A(8) Front hand	m/s²
		InsertedToolManufacturer:			

	Front hand			Rear hand		
Frequency	x-axis	y-axis	z-axis	x-axis	y-axis	z-axis
1.6	0.149	0.189	0.226	0.184	0.13	0.14
2	0.135	0.193	0.163	0.204	0.14	0.148
2.5	0.205	0.189	0.156	0.213	0.204	0.21
3.15	0.277	0.18	0.135	0.21	0.17	0.238
4	0.298	0.155	0.113	0.173	0.202	0.224
5	0.259	0.15	0.119	0.159	0.25	0.226
6.3	0.159	0.149	0.112	0.166	0.276	0.217
8	0.144	0.159	0.13	0.206	0.335	0.242
10	0.159	0.145	0.183	0.268	0.362	0.238
12.5	0.188	0.184	0.28	0.295	0.361	0.275
16	0.182	0.253	0.288	0.312	0.335	0.284
20	0.164	0.22	0.158	0.219	0.269	0.205
25	0.171	0.191	0.135	0.282	0.222	0.267
31.5	0.35	0.272	0.415	0.431	0.318	0.314
40	0.688	0.589	0.73	0.622	0.408	0.495
50	1.346	1.533	0.938	1.169	0.619	0.977
63	4.605	4.882	2.682	3.04	2.777	3.316
80	9.381	8.578	4.949	4.407	5.21	5.389
100	1.317	1.976	1.19	1.616	1.625	1.924
125	1.181	1.565	1.159	1.453	1.46	0.829
160	5.214	11.15	5.089	16.13	17.16	5.166
200	2.923	5.224	2.663	7.249	8.045	2.409
250	2.218	2.662	1.143	1.531	4.082	1.591
315	3.341	5.447	1.576	3.071	7.862	2.914
400	2.005	7.71	1.397	2.635	5.213	2.152
500	2.718	5.75	3.552	2.713	5.814	2.659
630	4.717	7.172	5.496	4.082	6.185	5.548
800	3.495	8.892	3.145	4.212	4.294	2.993
1000	4.925	11.09	3.076	6.108	5.555	3.742
1250	7.631	7.785	7.369	5.715	4.497	3.153
ahw	**2.442**	**2.642**	**1.531**	**2.3**	**2.5**	**1.7**
av		**3.9**			**3.8**	



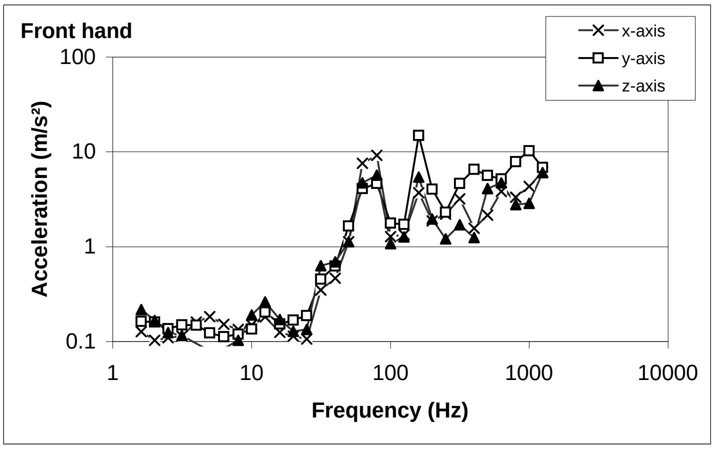


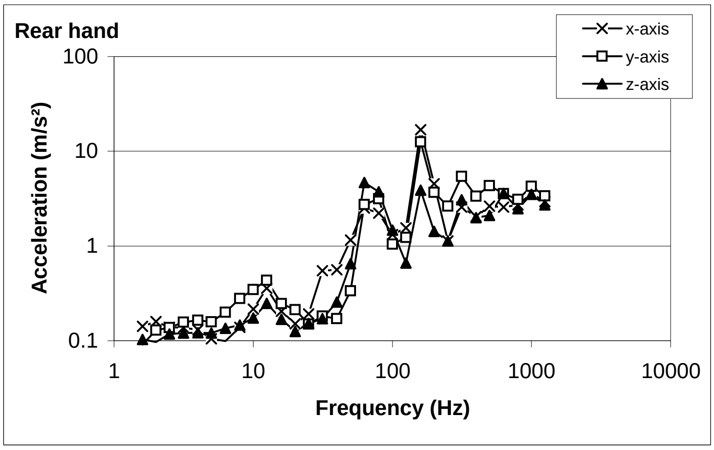


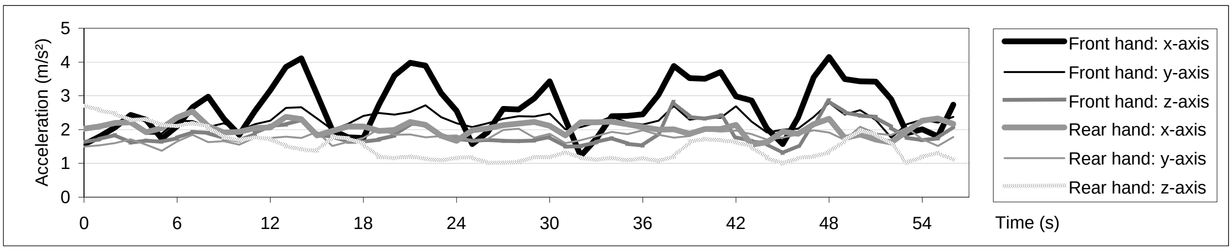
MainID: 1387, ResultsID: 10008

LocationName:		MachineManufacturer:	
		MachineModel:	
Occupation:	Grounds Maintenance	HSLAnonymisedToolLetter:	Machine C
Process:	Cutting conifer	MachineModifications:	
RecordDate:	October 20, 2010	MachineSize:	600mm blade
		MainID:	1387
		MachineWeight(kg):	6
		ResultsID:	10009
TapeNumber:	N/A	MachineOperating pressure:	
Operator#:	OP#3	MachineSpeed(impacts/min):	
	Vertical operation	MachineSpeed(revs/min):	
VideoNumber:	N/A	MachinePower:	
		MachinePower source:	2 stroke oil mix
		MeasurementTime:	57 Seconds
Notes:		NumShotsInMeas:	
		InsertedTool:	
		DailyExposureTime:	
DC-shift threshold:	*10 mm*	InsertedToolType:	
		A(8) Front hand	m/s²
		InsertedToolManufacturer:	

	Front hand			Rear hand		
Frequency	x-axis	y-axis	z-axis	x-axis	y-axis	z-axis
1.6	0.127	0.163	0.217	0.142	0.091	0.103
2	0.103	0.16	0.167	0.159	0.129	0.097
2.5	0.11	0.136	0.124	0.139	0.137	0.118
3.15	0.114	0.15	0.116	0.138	0.157	0.12
4	0.161	0.148	0.096	0.13	0.164	0.121
5	0.183	0.124	0.08	0.105	0.159	0.121
6.3	0.152	0.112	0.084	0.1	0.199	0.135
8	0.135	0.12	0.103	0.139	0.279	0.146
10	0.149	0.135	0.19	0.215	0.348	0.174
12.5	0.182	0.204	0.263	0.357	0.434	0.248
16	0.125	0.153	0.171	0.205	0.246	0.168
20	0.114	0.169	0.129	0.151	0.212	0.125
25	0.106	0.188	0.134	0.192	0.149	0.152
31.5	0.35	0.456	0.629	0.548	0.182	0.171
40	0.467	0.627	0.693	0.561	0.171	0.256
50	1.133	1.655	1.133	1.157	0.337	0.648
63	7.564	4.113	4.71	2.512	2.74	4.678
80	9.193	4.655	5.672	2.228	3.15	3.738
100	1.279	1.777	1.077	1.316	1.046	1.473
125	1.336	1.716	1.268	1.552	1.229	0.659
160	3.703	14.95	5.441	16.87	12.53	3.894
200	1.866	4.041	1.959	4.544	3.673	1.431
250	2.209	2.307	1.207	1.133	2.644	1.131
315	3.209	4.661	1.71	2.578	5.42	3.069
400	1.56	6.53	1.249	2.043	3.346	1.991
500	2.158	5.622	4.094	2.638	4.342	2.097
630	3.817	5.19	4.705	2.573	3.572	3.588
800	3.326	7.854	2.775	2.72	3.102	2.478
1000	4.345	10.29	2.877	3.601	4.278	3.51
1250	6.171	6.856	6.072	2.948	3.386	2.722
ahw	**2.8**	**2.296**	**1.919**	**2.1**	**1.8**	**1.6**
av		**4.1**			**3.2**	







MainID: 1387, ResultsID: 10009

Vibration Emission Test report - Full

Standard: BS EN ISO 10517:2009
N&V reference ID: Machine D Idling
Measurement File name:

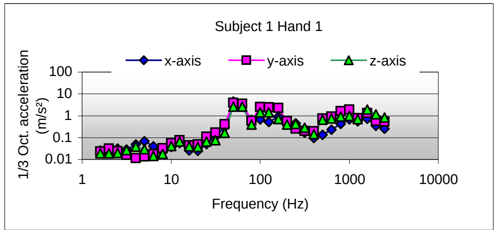
TestNo.	Operator	Meas. Name	Meas. Date	Meas Time	Hand Position 1 - Support a_{whx}	a_{why}	a_{whz}	a_{hv}	Operator Statistics Mean a_{hv}	S_{n-1}	C_v	Hand Position 2 - Throttle a_{whx}	a_{why}	a_{whz}	a_{hv}	Operator Statistics Mean a_{hv}	S_{n-1}	C_v
1	1	dle RH0	7/06/201	13:51:41:124	2.08	1.53	1.02	2.78				1.17	2.38	0.71	2.74			
2	1	dle RH0	7/06/201	13:52:33:999	1.96	1.68	1.22	2.85				1.21	2.16	1.18	2.74			
3	1	dle RH0	7/06/201	13:53:25:623	1.84	1.80	1.17	2.83	2.75	0.105	0.038	1.57	1.71	1.22	2.62	2.75	0.124	0.045
4	1	dle RH0	7/06/201	13:54:18:123	1.49	1.89	1.15	2.67				1.77	1.57	1.25	2.67			
5	1	dle RH0	7/06/201	13:55:06:749	1.20	1.90	1.33	2.61				2.36	1.37	1.12	2.95			
6	2	dle SH0	7/06/201	13:58:01:373	2.08	3.35	0.88	4.04				1.26	2.59	1.84	3.42			
7	2	dle SH0	7/06/201	13:58:56:124	1.73	3.73	1.20	4.28				1.82	1.72	1.53	2.93			
8	2	dle SH0	7/06/201	13:59:48:749	1.50	3.89	1.23	4.34	4.23	0.151	0.036	2.21	1.68	1.40	3.12	3.05	0.231	0.076
9	2	dle SH0	7/06/201	14:00:41:623	1.47	3.96	1.11	4.37				1.55	1.91	1.61	2.94			
10	2	dle SH0	7/06/201	14:01:34:498	1.33	3.71	1.09	4.09				1.54	1.75	1.61	2.83			
11	3	dle MM0	7/06/201	14:05:08:249	1.94	1.71	0.40	2.61				1.36	2.12	1.41	2.89			
12	3	dle MM0	7/06/201	14:06:02:374	1.54	1.87	0.95	2.60				1.30	1.16	1.50	2.29			
13	3	dle MM0	7/06/201	14:06:57:623	1.66	2.14	0.95	2.87	2.82	0.248	0.088	2.05	1.59	2.07	3.32	2.40	0.693	0.288
14	3	dle MM0	7/06/201	14:08:12:748	1.34	2.63	1.25	3.21				0.52	1.14	1.23	1.75			
15	3	dle MM0	7/06/201	14:09:02:624	1.85	2.03	0.73	2.84				0.73	1.07	1.19	1.76			

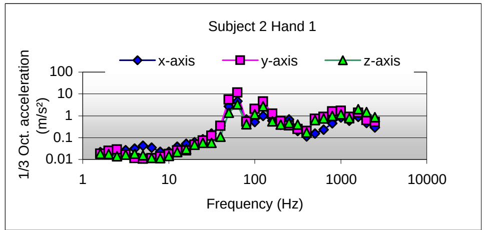
	Hand Position 1 - Support		Hand Position 2 - Throttle	
a_h (overall mean a_{hv}):	3.27	m/s²	2.73	m/s²
$\sigma_{R(single\ m/c.)}$:	0.74	m/s²	0.59	m/s²
$K_{(single\ m/c.)}$ value:	1.22	m/s²	0.98	m/s²

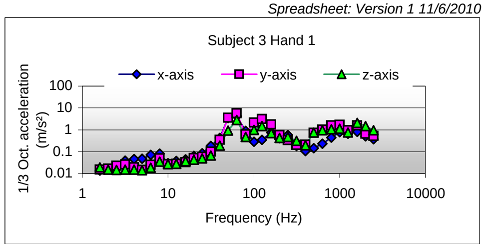
Single machine declared emission a_{hd} (= greatest a_h value): 3.27 m/s² **$K_{(single\ m/c.)}$ value: 1.22 m/s²**

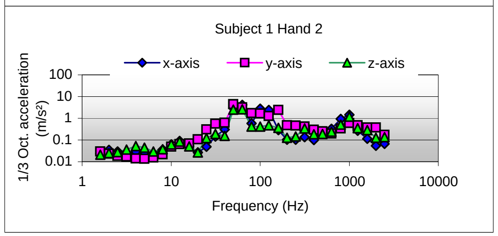
Pulse file version: Hedge trimmer emission - Dual triggered averaging time V1.0 2010-06-11.pls

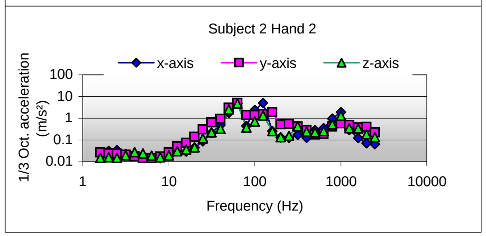
Spreadsheet: Version 1 11/6/2010

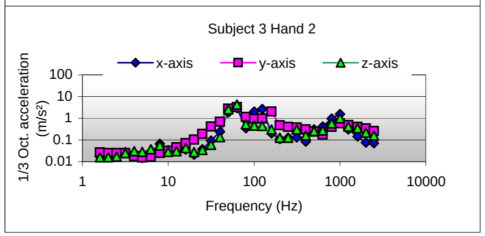












Vibration Emission Test report - Full

Standard: BS EN ISO 10517:2009

N&V reference ID: Machine D Racing

Measurement File name:

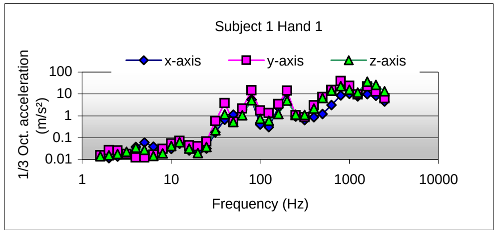
					Hand Position 1 - Support							Hand Position 2 - Throttle						
									Operator Statistics							Operator Statistics		
TestNo.	Operator	Meas. Name	Meas. Date	Meas Time	a_{whx}	a_{why}	a_{whz}	a_{hv}	Mean a_{hv}	S_{n-1}	C_v	a_{whx}	a_{why}	a_{whz}	a_{hv}	Mean a_{hv}	S_{n-1}	C_v
1	1	cing RH	7/06/201	13:52:07:623	1.84	4.00	1.47	4.64	4.31	0.274	0.064	2.06	2.72	1.25	3.63	3.52	0.145	0.041
2	1	cing RH	7/06/201	13:53:00:123	1.70	3.94	1.45	4.53				1.48	2.62	1.26	3.27			
3	1	cing RH	7/06/201	13:53:53:874	1.63	3.69	1.43	4.28				2.27	2.56	1.02	3.57			
4	1	cing RH	7/06/201	13:54:42:373	1.48	3.55	1.40	4.09				2.24	2.61	1.00	3.58			
5	1	cing RH	7/06/201	13:55:32:748	1.41	3.45	1.48	4.01				2.11	2.66	1.00	3.54			
6	2	cing SH	7/06/201	13:58:27:499	1.28	3.24	1.58	3.82	3.91	0.061	0.016	1.69	3.10	1.36	3.79	3.70	0.084	0.023
7	2	cing SH	7/06/201	13:59:21:249	1.31	3.30	1.71	3.94				1.83	3.05	1.32	3.79			
8	2	cing SH	7/06/201	14:00:14:124	1.32	3.28	1.68	3.91				1.60	3.08	1.22	3.68			
9	2	cing SH	7/06/201	14:01:06:749	1.31	3.20	1.75	3.88				1.46	3.01	1.31	3.59			
10	2	cing SH	7/06/201	14:02:00:749	1.33	3.27	1.83	3.98				1.74	2.99	1.27	3.68			
11	3	cing MM	7/06/201	14:05:33:248	1.84	4.34	1.36	4.91	4.95	0.326	0.066	2.25	2.59	1.94	3.94	3.76	0.175	0.046
12	3	cing MM	7/06/201	14:06:30:373	1.74	4.49	1.41	5.02				2.46	2.35	1.99	3.94			
13	3	cing MM	7/06/201	14:07:21:874	1.99	4.64	1.46	5.25				2.11	2.29	1.93	3.66			
14	3	cing MM	7/06/201	14:08:36:498	2.07	4.49	1.49	5.16				2.23	2.54	1.59	3.73			
15	3	cing MM	7/06/201	14:09:26:374	1.61	3.83	1.53	4.42				1.72	2.81	1.30	3.54			

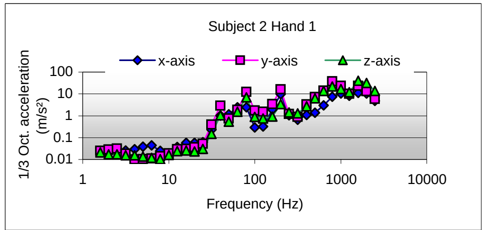
	Hand Position 1 - Support			Hand Position 2 - Throttle		
	a_h (overall mean a_{hv}) :	4.39	m/s²	a_h (overall mean a_{hv}):	3.66	m/s²
	$\sigma_{R(single\ m/c.)}$:	0.55	m/s²	$\sigma_{R(single\ m/c.)}$:	0.22	m/s²
	$K_{(single\ m/c.)}$ value:	0.90	m/s²	$K_{(single\ m/c.)}$ value:	0.36	m/s²

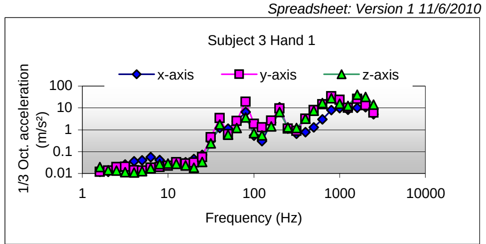
Single machine declared emission a_{hd} (= greatest a_h value): 4.39 m/s² **$K_{(single\ m/c.)}$ value: 0.90 m/s²**

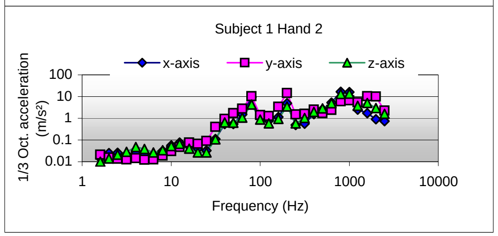
Pulse file version: Hedge trimmer emission - Dual triggered averaging time V1.0 2010-06-11.pls

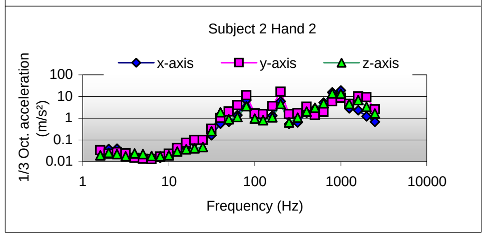
Spreadsheet: Version 1 11/6/2010

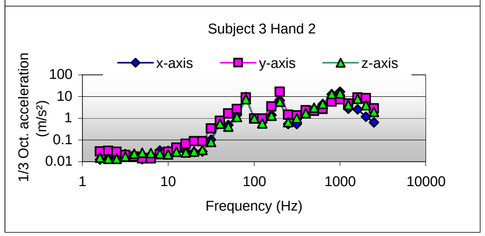












LocationName:

Occupation: Grounds Maintenance
Process: Cutting thick shrub
RecordDate: October 20, 2010

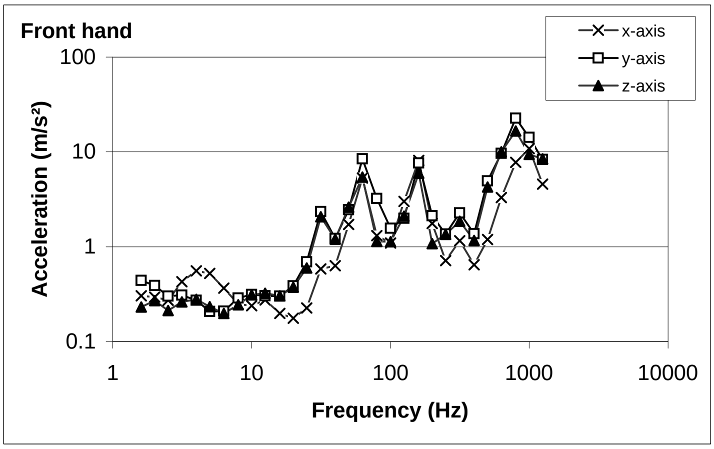
TapeNumber: N/A
Operator#: OP#1
Horizontal operation
VideoNumber: N/A

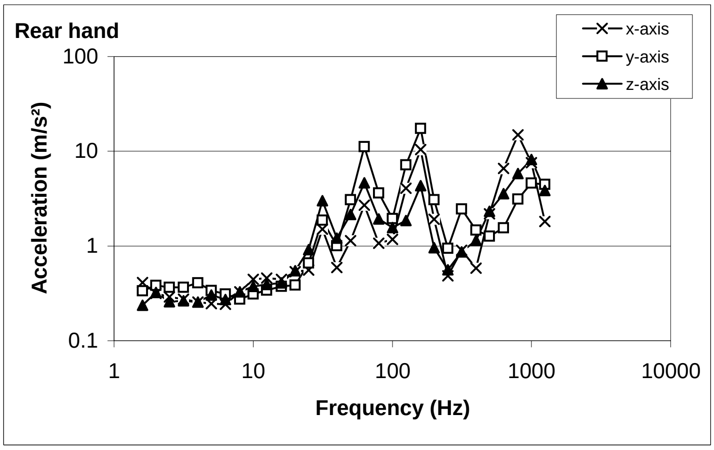
Notes:

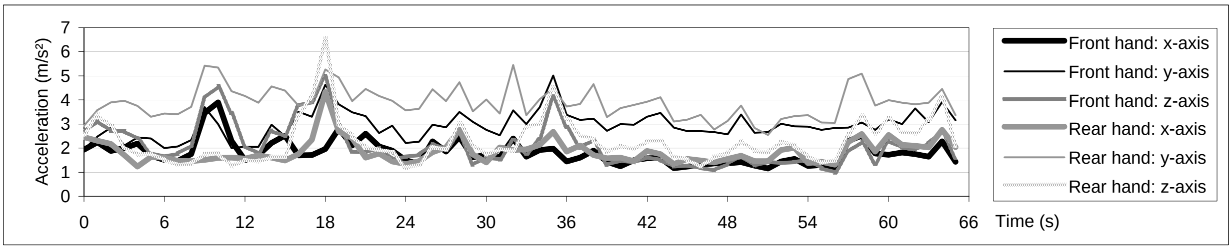
DC-shift threshold: *10* *mm*

MachineManufacturer:
MachineModel:
HSLAnonymisedToolLetter: Machine D
MachineModifications:
MachineSize: 735mm blade
MainID: 1388
MachineWeight(kg): 6.3
ResultsID: 10010
MachineOperating pressure:
MachineSpeed(impacts/min):
MachineSpeed(revs/min):
MachinePower:
MachinePower source: 2 stroke oil mix
MeasurementTime: 66.5 Seconds
NumShotsInMeas:
InsertedTool:
DailyExposureTime:
InsertedToolType:
A(8) Front hand m/s²
InsertedToolManufacturer:

	Front hand			Rear hand		
Frequency	x-axis	y-axis	z-axis	x-axis	y-axis	z-axis
1.6	0.304	0.442	0.232	0.413	0.336	0.237
2	0.294	0.389	0.27	0.316	0.385	0.323
2.5	0.272	0.301	0.212	0.291	0.366	0.259
3.15	0.428	0.309	0.262	0.274	0.365	0.264
4	0.559	0.272	0.278	0.256	0.408	0.255
5	0.523	0.208	0.234	0.246	0.339	0.303
6.3	0.366	0.209	0.197	0.243	0.311	0.273
8	0.248	0.287	0.243	0.327	0.275	0.329
10	0.238	0.312	0.312	0.444	0.311	0.374
12.5	0.275	0.304	0.324	0.458	0.342	0.392
16	0.199	0.301	0.305	0.446	0.376	0.409
20	0.176	0.386	0.374	0.538	0.386	0.548
25	0.226	0.691	0.597	0.555	0.66	0.913
31.5	0.581	2.336	2.064	1.501	1.866	3.006
40	0.632	1.22	1.198	0.594	1.007	1.209
50	1.713	2.447	2.62	1.137	3.067	2.16
63	5.32	8.48	5.413	2.696	11.2	4.647
80	1.306	3.228	1.141	1.069	3.624	1.926
100	1.094	1.567	1.128	1.171	1.952	1.56
125	3	1.991	2.106	4.058	7.191	1.861
160	8.128	7.612	5.969	10.4	17.42	4.325
200	1.765	2.115	1.081	1.913	3.08	0.958
250	0.714	1.362	1.351	0.486	0.945	0.563
315	1.159	2.274	1.852	0.901	2.463	0.87
400	0.643	1.369	1.167	0.585	1.467	1.146
500	1.194	4.956	4.266	2.181	1.267	2.322
630	3.292	9.676	9.996	6.605	1.551	3.571
800	7.783	22.64	16.65	14.96	3.119	5.807
1000	10.82	14.26	9.43	7.6	4.606	8.175
1250	4.576	8.343	8.448	1.814	4.465	3.867
ahw	**1.941**	**3.036**	**2.317**	**2.0**	**4.0**	**2.5**
av		**4.3**			**5.1**	



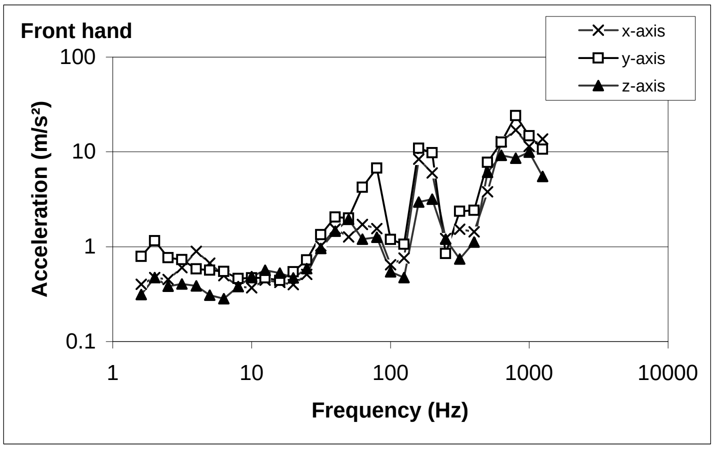


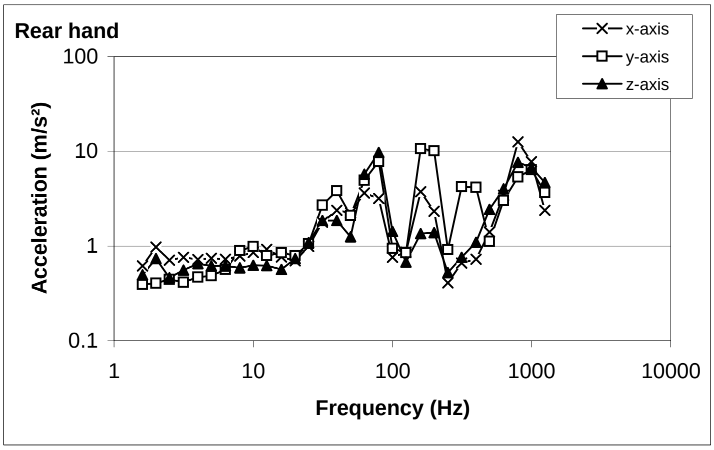


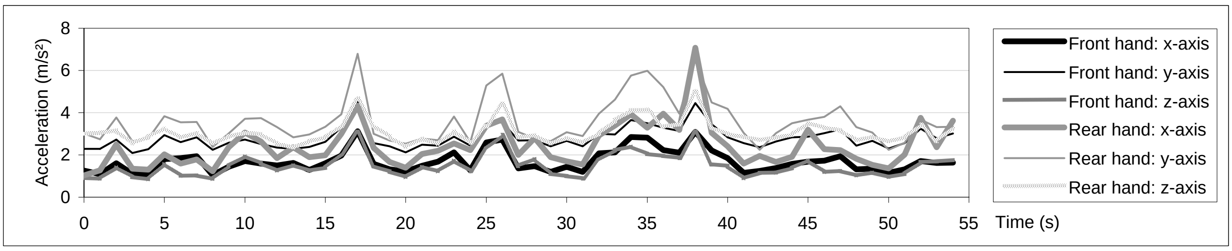
MainID: 1388, ResultsID: 10010

LocationName:		MachineManufacturer:			
		MachineModel:			
Occupation:	Grounds Maintenance			HSLAnonymisedToolLetter:	Machine D
Process:	Cutting thick shrub	MachineModifications:			
RecordDate:	October 20, 2010	MachineSize:	735mm blade	MainID:	1389
		MachineWeight(kg):	6.3	ResultsID:	10013
TapeNumber:	N/A	MachineOperating pressure:			
Operator#:	OP#1	MachineSpeed(impacts/min):			
	Vertical operation	MachineSpeed(revs/min):			
VideoNumber:	N/A	MachinePower:			
		MachinePower source:	2 stroke oil mix	MeasurementTime:	55 Seconds
Notes:				NumShotsInMeas:	
		InsertedTool:		DailyExposureTime:	
DC-shift threshold:	*10 mm*	InsertedToolType:		A(8) Front hand	m/s²
		InsertedToolManufacturer:			

	Front hand			Rear hand		
Frequency	x-axis	y-axis	z-axis	x-axis	y-axis	z-axis
1.6	0.403	0.79	0.312	0.614	0.393	0.495
2	0.472	1.153	0.473	0.973	0.405	0.736
2.5	0.45	0.763	0.383	0.709	0.446	0.462
3.15	0.604	0.733	0.407	0.762	0.415	0.557
4	0.896	0.582	0.386	0.717	0.468	0.653
5	0.669	0.564	0.308	0.743	0.486	0.618
6.3	0.494	0.55	0.284	0.727	0.566	0.615
8	0.381	0.463	0.381	0.785	0.897	0.588
10	0.368	0.47	0.486	0.856	0.991	0.626
12.5	0.444	0.468	0.567	0.92	0.791	0.619
16	0.42	0.44	0.528	0.763	0.846	0.567
20	0.397	0.546	0.47	0.698	0.79	0.736
25	0.513	0.724	0.588	0.987	1.058	1.09
31.5	1.02	1.336	0.962	1.781	2.692	1.856
40	1.542	2.051	1.464	2.376	3.828	1.851
50	1.266	2.011	1.949	2.24	2.111	1.249
63	1.714	4.227	1.205	3.621	4.931	5.718
80	1.557	6.74	1.263	3.169	7.814	9.71
100	0.647	1.188	0.544	0.758	0.946	1.431
125	0.761	1.061	0.473	0.863	0.844	0.674
160	8.36	10.92	2.96	3.751	10.67	1.347
200	6.015	9.816	3.186	2.322	10.12	1.385
250	1.22	0.848	1.199	0.407	0.917	0.522
315	1.53	2.358	0.743	0.662	4.228	0.758
400	1.436	2.416	1.121	0.723	4.181	1.098
500	3.806	7.744	6.085	1.403	1.124	2.434
630	12.84	12.68	9.211	3.427	3.029	4.014
800	17.01	24.14	8.578	12.6	5.323	7.636
1000	11.47	14.8	9.931	7.749	6.403	6.747
1250	13.63	10.64	5.519	2.385	3.678	4.675
ahw	**1.881**	**2.907**	**1.646**	**2.7**	**3.8**	**3.2**
av		**3.8**			**5.7**	



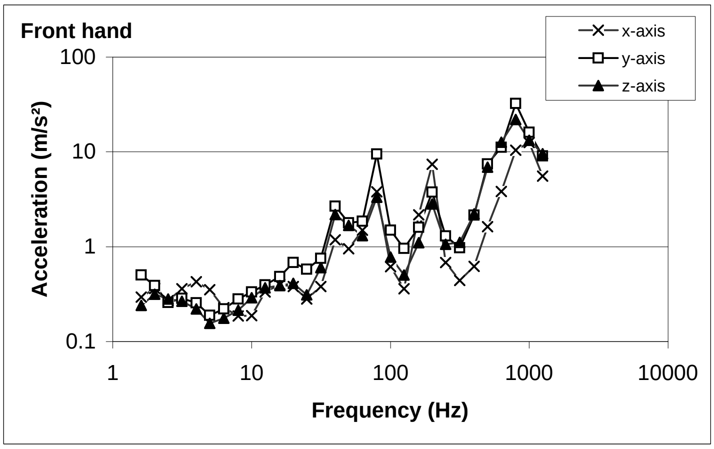


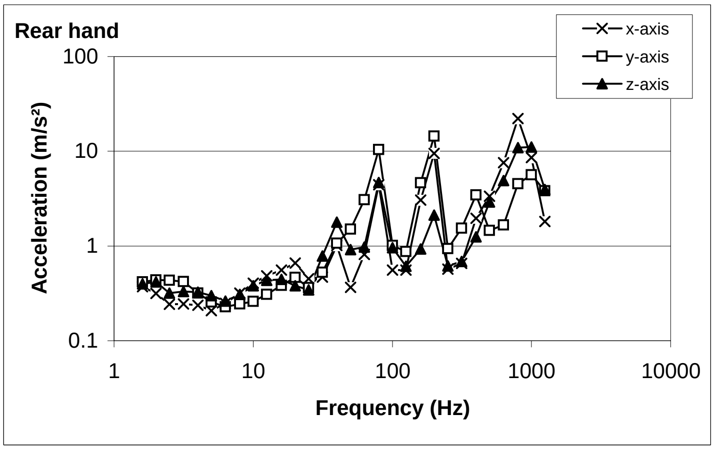


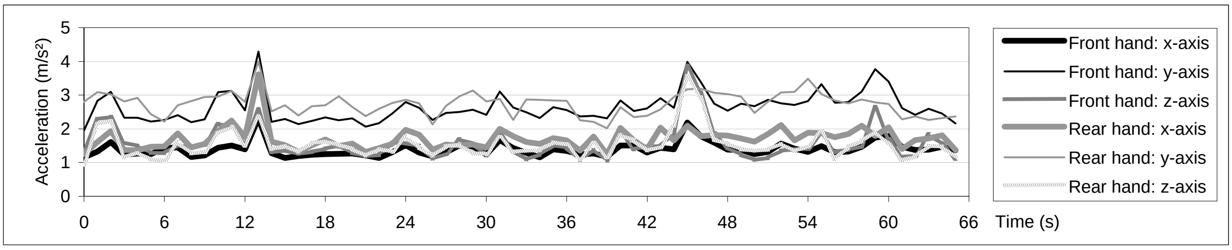
MainID: 1389, ResultsID: 10013

LocationName:	[redacted]	MachineManufacturer: MachineModel:	[redacted]
		HSLAnonymisedToolLetter:	Machine D
Occupation:	Grounds Maintenance	MachineModifications:	
Process:	Cutting thick shrub	MachineSize:	735mm blade
RecordDate:	October 20, 2010	MainID:	1388
		MachineWeight(kg):	6.3
		ResultsID:	10011
TapeNumber:	N/A	MachineOperating pressure:	
Operator#:	OP#2	MachineSpeed(impacts/min):	
	Horizontal operation	MachineSpeed(revs/min):	
VideoNumber:	N/A	MachinePower:	
		MachinePower source:	2 stroke oil mix
		MeasurementTime:	67 Seconds
Notes:		NumShotsInMeas:	
		InsertedTool:	
		DailyExposureTime:	
DC-shift threshold:	*10 mm*	InsertedToolType:	
		A(8) Front hand	m/s²
		InsertedToolManufacturer:	[redacted]

	Front hand			Rear hand		
Frequency	x-axis	y-axis	z-axis	x-axis	y-axis	z-axis
1.6	0.294	0.502	0.24	0.373	0.419	0.399
2	0.363	0.389	0.316	0.316	0.439	0.418
2.5	0.27	0.258	0.282	0.242	0.434	0.317
3.15	0.359	0.285	0.266	0.244	0.422	0.331
4	0.428	0.255	0.221	0.237	0.319	0.326
5	0.351	0.189	0.156	0.208	0.256	0.299
6.3	0.229	0.221	0.176	0.249	0.228	0.262
8	0.187	0.28	0.213	0.318	0.245	0.309
10	0.187	0.333	0.29	0.405	0.26	0.382
12.5	0.334	0.397	0.368	0.485	0.309	0.434
16	0.4	0.483	0.388	0.557	0.385	0.444
20	0.381	0.684	0.41	0.663	0.467	0.382
25	0.281	0.578	0.311	0.451	0.362	0.343
31.5	0.38	0.756	0.603	0.469	0.528	0.784
40	1.181	2.678	2.192	1.014	1.073	1.784
50	0.956	1.785	1.678	0.367	1.504	0.919
63	1.497	1.858	1.311	0.813	3.084	0.978
80	3.783	9.469	3.319	4.418	10.45	4.677
100	0.618	1.489	0.776	0.558	1.016	0.962
125	0.362	0.959	0.503	0.557	0.874	0.614
160	2.175	1.6	1.103	3.06	4.636	0.933
200	7.427	3.755	2.828	9.512	14.44	2.125
250	0.684	1.301	1.058	0.572	0.934	0.614
315	0.443	0.976	1.114	0.657	1.536	0.686
400	0.62	2.147	2.219	1.955	3.459	1.246
500	1.624	7.444	6.895	3.344	1.459	2.925
630	3.83	11.21	12.67	7.567	1.66	4.894
800	10.39	32.3	22.01	22.23	4.53	10.91
1000	12.58	16.11	13.26	8.606	5.659	11.08
1250	5.541	9.08	9.595	1.814	3.839	3.956
ahw	**1.453**	**2.706**	**1.66**	**1.8**	**2.8**	**1.6**
av		**3.5**			**3.7**	



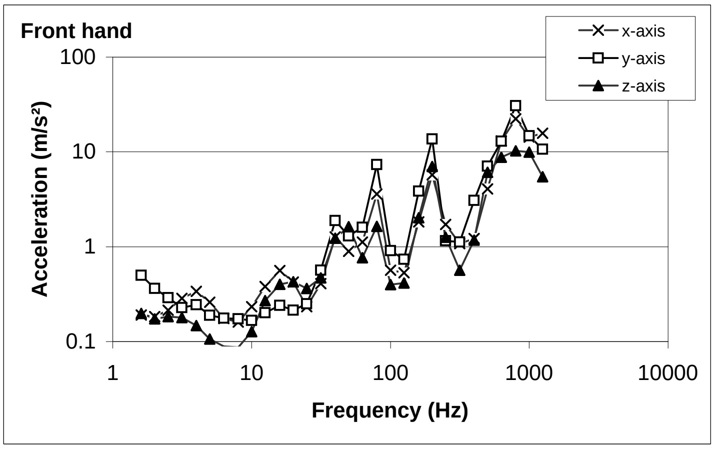


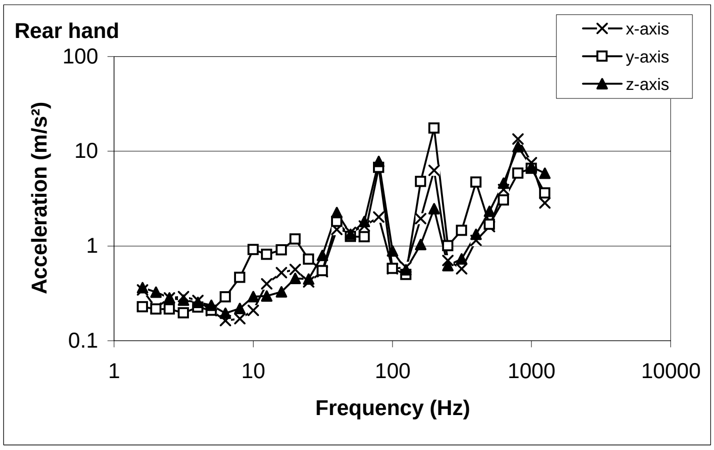


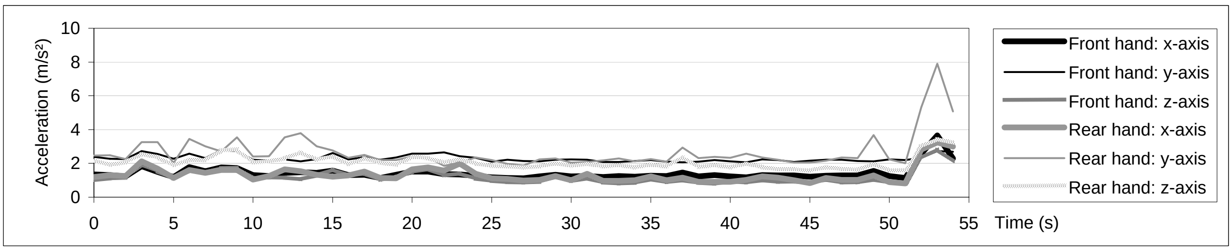
MainID: 1388, ResultsID: 10011

LocationName:		MachineManufacturer:			
		MachineModel:			
Occupation:	Grounds Maintenance			HSLAnonymisedToolLetter:	Machine D
Process:	Cutting thick shrub	MachineModifications:			
RecordDate:	October 20, 2010	MachineSize:	735mm blade	MainID:	1389
		MachineWeight(kg):	6.3	ResultsID:	10014
TapeNumber:	N/A	MachineOperating pressure:			
Operator#:	OP#2	MachineSpeed(impacts/min):			
	Vertical operation	MachineSpeed(revs/min):			
VideoNumber:	N/A	MachinePower:			
		MachinePower source:	2 stroke oil mix	MeasurementTime:	55 Seconds
Notes:				NumShotsInMeas:	
		InsertedTool:		DailyExposureTime:	
DC-shift threshold:	*10 mm*	InsertedToolType:		A(8) Front hand	m/s²
		InsertedToolManufacturer:			

	Front hand			Rear hand		
Frequency	x-axis	y-axis	z-axis	x-axis	y-axis	z-axis
1.6	0.191	0.498	0.199	0.343	0.227	0.364
2	0.183	0.365	0.174	0.22	0.215	0.326
2.5	0.215	0.29	0.183	0.283	0.216	0.284
3.15	0.286	0.229	0.18	0.292	0.196	0.268
4	0.338	0.245	0.147	0.267	0.227	0.254
5	0.259	0.189	0.107	0.207	0.21	0.236
6.3	0.174	0.177	0.089	0.163	0.291	0.195
8	0.161	0.173	0.087	0.171	0.465	0.22
10	0.234	0.166	0.127	0.209	0.913	0.291
12.5	0.381	0.201	0.271	0.399	0.814	0.297
16	0.563	0.24	0.402	0.524	0.907	0.33
20	0.424	0.214	0.429	0.567	1.185	0.455
25	0.233	0.25	0.363	0.416	0.723	0.447
31.5	0.408	0.565	0.47	0.536	0.548	0.793
40	1.266	1.892	1.227	1.492	1.821	2.26
50	0.894	1.295	1.622	1.398	1.255	1.334
63	1.12	1.599	0.763	1.624	1.251	1.817
80	3.587	7.374	1.641	2.022	6.742	7.794
100	0.566	0.907	0.399	0.573	0.577	0.89
125	0.53	0.735	0.416	0.596	0.501	0.56
160	1.821	3.85	2.02	1.952	4.775	1.039
200	5.731	13.64	7.017	6.273	17.49	2.478
250	1.715	1.153	1.259	0.706	1.006	0.621
315	1.074	1.118	0.566	0.574	1.455	0.733
400	1.223	3.08	1.175	1.148	4.709	1.328
500	4.071	7.082	6.098	1.606	1.686	2.326
630	13.05	12.93	8.788	3.934	3.047	4.605
800	22.24	30.63	10.25	13.51	5.884	11.14
1000	14.37	14.78	9.917	7.588	6.569	6.831
1250	15.73	10.71	5.486	2.853	3.626	5.881
ahw	**1.509**	**2.325**	**1.285**	**1.5**	**2.9**	**2.2**
av		**3.1**			**3.9**	



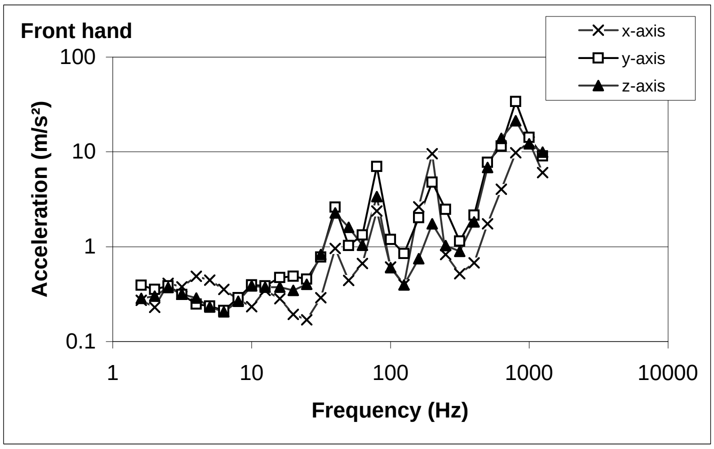


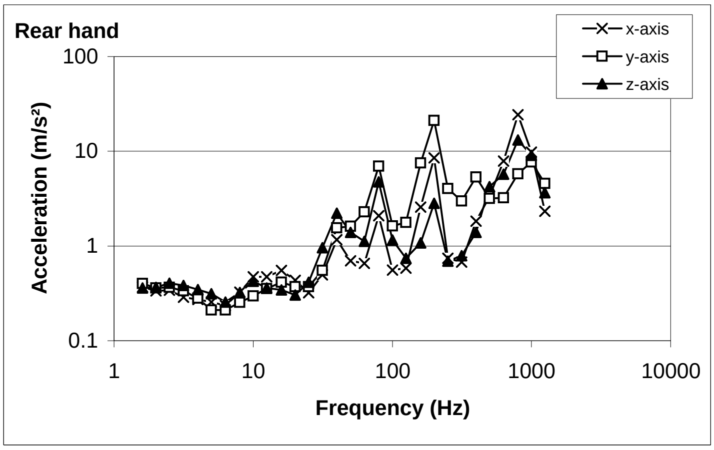


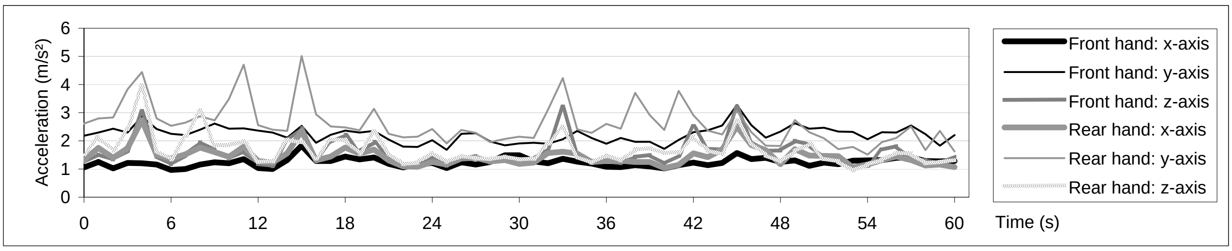
MainID: 1389, ResultsID: 10014

LocationName:		MachineManufacturer:			
		MachineModel:			
Occupation:	Grounds Maintenance			HSLAnonymisedToolLetter:	Machine D
Process:	Cutting thick shrub	MachineModifications:			
RecordDate:	October 20, 2010	MachineSize:	735mm blade	MainID:	1388
		MachineWeight(kg):	6.3	ResultsID:	10012
TapeNumber:	N/A	MachineOperating pressure:			
Operator#:	OP#3	MachineSpeed(impacts/min):			
	Horizontal operation	MachineSpeed(revs/min):			
VideoNumber:	N/A	MachinePower:			
		MachinePower source:	2 stroke oil mix	MeasurementTime:	61.75 Seconds
Notes:				NumShotsInMeas:	
		InsertedTool:		DailyExposureTime:	
DC-shift threshold:	*10 mm*	InsertedToolType:		A(8) Front hand	m/s²
		InsertedToolManufacturer:			

	Front hand			Rear hand		
Frequency	x-axis	y-axis	z-axis	x-axis	y-axis	z-axis
1.6	0.273	0.391	0.285	0.369	0.403	0.361
2	0.23	0.354	0.301	0.335	0.362	0.367
2.5	0.412	0.386	0.371	0.341	0.366	0.404
3.15	0.379	0.313	0.315	0.287	0.336	0.382
4	0.488	0.248	0.288	0.272	0.281	0.347
5	0.445	0.238	0.231	0.256	0.211	0.313
6.3	0.355	0.212	0.206	0.235	0.211	0.256
8	0.276	0.291	0.267	0.326	0.253	0.324
10	0.233	0.395	0.387	0.475	0.297	0.424
12.5	0.347	0.388	0.374	0.472	0.354	0.362
16	0.284	0.474	0.374	0.553	0.414	0.343
20	0.193	0.489	0.346	0.433	0.372	0.303
25	0.17	0.454	0.401	0.321	0.371	0.416
31.5	0.289	0.777	0.83	0.497	0.554	0.961
40	0.962	2.611	2.273	1.162	1.553	2.229
50	0.442	1.025	1.604	0.698	1.614	1.398
63	0.664	1.328	1.033	0.656	2.288	1.122
80	2.377	7.024	3.39	2.086	6.973	4.773
100	0.611	1.193	0.601	0.558	1.626	1.154
125	0.4	0.847	0.395	0.583	1.772	0.741
160	2.624	2.015	0.748	2.578	7.506	1.079
200	9.604	4.799	1.743	8.501	21.07	2.819
250	0.83	2.477	1.031	0.742	4.039	0.69
315	0.517	1.147	0.895	0.674	2.988	0.787
400	0.679	2.159	1.832	1.826	5.335	1.396
500	1.743	7.732	6.866	3.326	3.176	4.248
630	4.027	11.53	13.85	7.908	3.226	5.708
800	9.759	33.95	21.23	24.26	5.787	13.18
1000	12.74	14.25	12.16	9.778	7.684	9.08
1250	6.054	9.07	9.939	2.331	4.565	3.662
ahw	**1.305**	**2.288**	**1.704**	**1.5**	**2.7**	**1.8**
av		**3.1**			**3.6**	



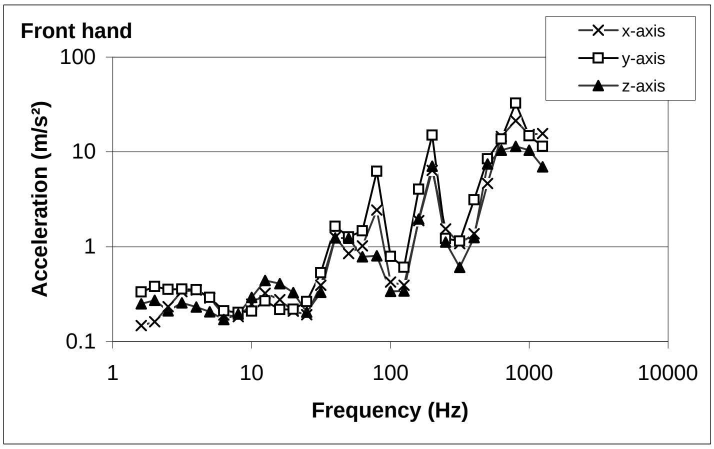


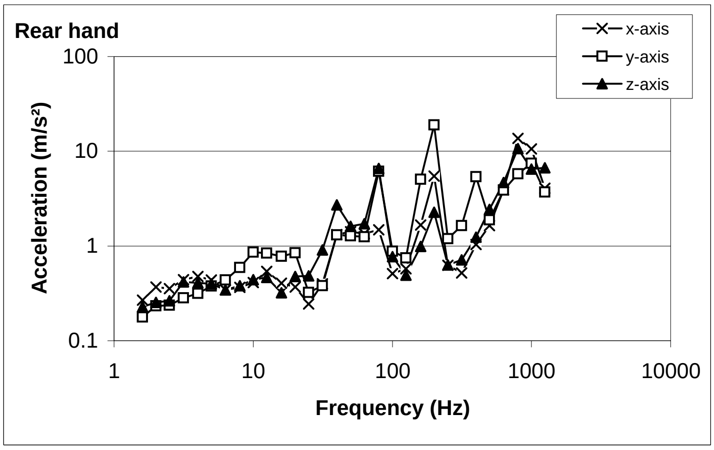


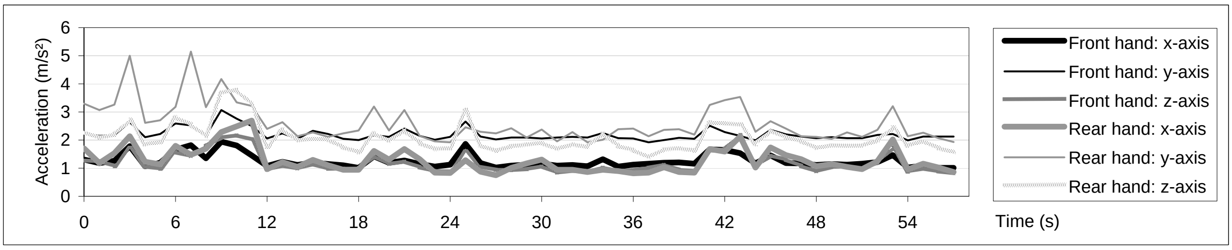
MainID: 1388, ResultsID: 10012

LocationName:		MachineManufacturer:			
		MachineModel:			
Occupation:	Grounds Maintenance			HSLAnonymisedToolLetter:	Machine D
Process:	Cutting thick shrub	MachineModifications:			
RecordDate:	October 20, 2010	MachineSize:	735mm blade	MainID:	1389
		MachineWeight(kg):	6.3	ResultsID:	10015
TapeNumber:	N/A	MachineOperating pressure:			
Operator#:	OP#3	MachineSpeed(impacts/min):			
	Vertical operation	MachineSpeed(revs/min):			
VideoNumber:	N/A	MachinePower:			
		MachinePower source:	2 stroke oil mix	MeasurementTime:	58.75 Seconds
Notes:				NumShotsInMeas:	
		InsertedTool:		DailyExposureTime:	
DC-shift threshold:	*10 mm*	InsertedToolType:		A(8) Front hand	m/s²
		InsertedToolManufacturer:			

	Front hand			Rear hand		
Frequency	x-axis	y-axis	z-axis	x-axis	y-axis	z-axis
1.6	0.147	0.333	0.25	0.269	0.177	0.228
2	0.162	0.381	0.272	0.368	0.233	0.255
2.5	0.234	0.356	0.211	0.355	0.237	0.265
3.15	0.336	0.357	0.256	0.44	0.284	0.418
4	0.349	0.352	0.231	0.478	0.316	0.408
5	0.289	0.293	0.206	0.437	0.378	0.4
6.3	0.191	0.212	0.17	0.344	0.437	0.343
8	0.184	0.202	0.195	0.367	0.59	0.381
10	0.248	0.209	0.293	0.41	0.858	0.44
12.5	0.324	0.269	0.442	0.538	0.837	0.464
16	0.276	0.217	0.41	0.404	0.778	0.321
20	0.208	0.219	0.329	0.37	0.847	0.476
25	0.192	0.265	0.205	0.244	0.323	0.483
31.5	0.391	0.532	0.33	0.399	0.381	0.911
40	1.259	1.644	1.24	1.323	1.304	2.723
50	0.849	1.268	1.235	1.419	1.278	1.615
63	1.02	1.475	0.783	1.352	1.245	1.725
80	2.437	6.254	0.8	1.48	6.159	6.609
100	0.423	0.788	0.338	0.513	0.879	0.77
125	0.391	0.607	0.34	0.575	0.749	0.492
160	1.89	4.049	1.959	1.663	5.047	0.988
200	6.38	14.99	7.04	5.48	18.97	2.271
250	1.545	1.218	1.125	0.627	1.19	0.629
315	1.077	1.145	0.609	0.517	1.635	0.712
400	1.376	3.121	1.245	1.039	5.369	1.237
500	4.636	8.421	7.47	1.642	1.889	2.429
630	14.5	13.66	10.4	3.919	3.871	4.686
800	21.33	32.54	11.42	13.72	5.79	10.68
1000	15.26	14.84	10.43	10.6	7.48	6.489
1250	15.61	11.4	6.957	4.072	3.697	6.678
ahw	**1.316**	**2.237**	**1.272**	**1.4**	**2.7**	**2.2**
av		**2.9**			**3.8**	



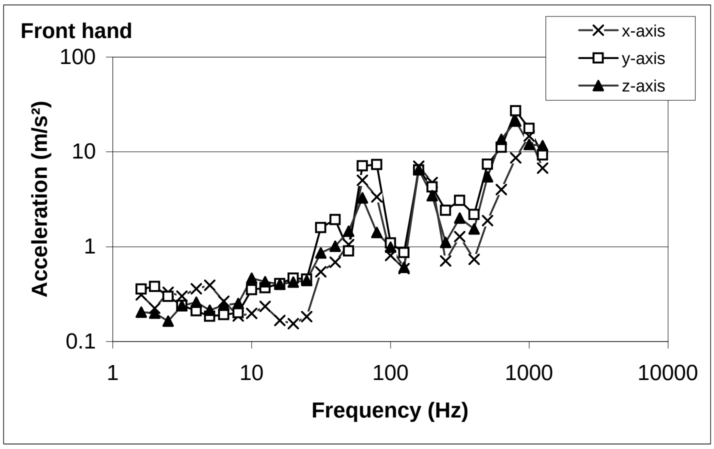


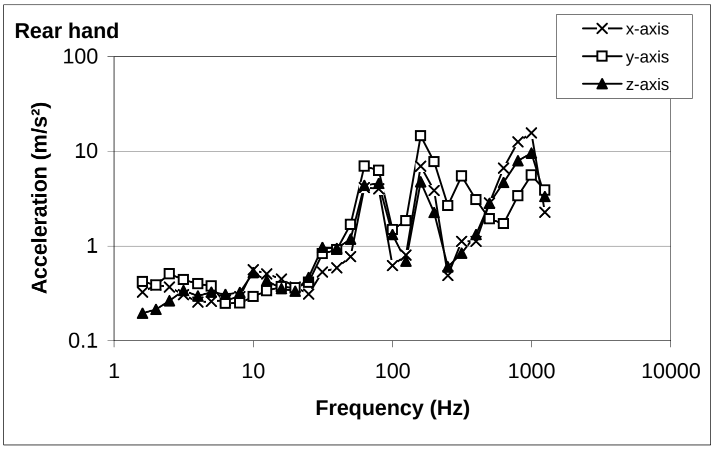


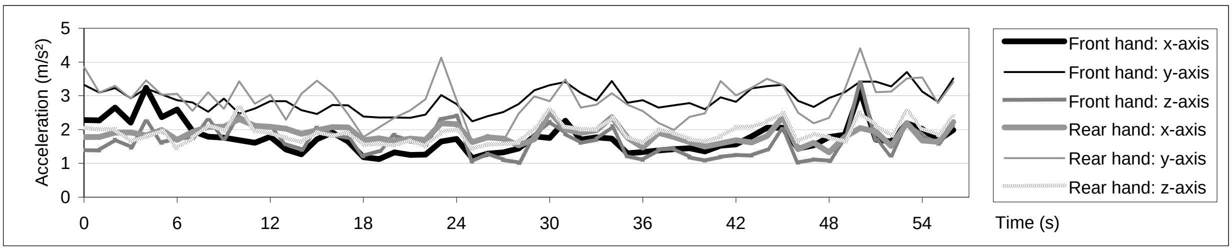
MainID: 1389, ResultsID: 10015

LocationName:	[redacted]	MachineManufacturer: MachineModel:	[redacted]		
Occupation:	Grounds Maintenance			HSLAnonymisedToolLetter:	Machine D
Process:	Cutting thin shrub	MachineModifications:			
RecordDate:	October 20, 2010	MachineSize:	735mm blade	MainID:	1390
		MachineWeight(kg):	6.3	ResultsID:	10016
TapeNumber:	N/A	MachineOperating pressure:			
Operator#:	OP#1	MachineSpeed(impacts/min):			
	Horizontal operation	MachineSpeed(revs/min):			
VideoNumber:	N/A	MachinePower:			
		MachinePower source:	2 stroke oil mix	MeasurementTime:	57 Seconds
Notes:				NumShotsInMeas:	
		InsertedTool:		DailyExposureTime:	
DC-shift threshold:	*10 mm*	InsertedToolType:		A(8) Front hand	m/s²
		InsertedToolManufacturer:	[redacted]		

	Front hand			Rear hand		
Frequency	x-axis	y-axis	z-axis	x-axis	y-axis	z-axis
1.6	0.311	0.359	0.204	0.325	0.42	0.195
2	0.224	0.38	0.199	0.387	0.386	0.214
2.5	0.331	0.299	0.165	0.37	0.507	0.264
3.15	0.302	0.241	0.239	0.307	0.443	0.339
4	0.36	0.21	0.259	0.256	0.399	0.296
5	0.393	0.185	0.214	0.261	0.377	0.326
6.3	0.266	0.192	0.242	0.268	0.248	0.309
8	0.187	0.202	0.251	0.292	0.25	0.324
10	0.198	0.351	0.465	0.563	0.293	0.523
12.5	0.236	0.368	0.428	0.506	0.336	0.431
16	0.167	0.407	0.401	0.449	0.373	0.354
20	0.154	0.466	0.424	0.368	0.361	0.334
25	0.184	0.456	0.441	0.311	0.416	0.465
31.5	0.543	1.588	0.859	0.533	0.83	0.969
40	0.686	1.936	1.011	0.59	0.918	0.947
50	1.051	0.899	1.455	0.772	1.688	1.186
63	5.01	7.126	3.286	4.144	6.937	4.374
80	3.358	7.361	1.419	4.014	6.284	4.565
100	0.812	1.092	0.992	0.62	1.49	1.322
125	0.586	0.867	0.609	0.8	1.846	0.692
160	7.05	6.448	6.513	6.952	14.56	4.766
200	4.766	4.259	3.45	3.848	7.743	2.25
250	0.711	2.426	1.113	0.489	2.674	0.601
315	1.28	3.084	2.008	1.123	5.46	0.837
400	0.734	2.188	1.546	1.117	3.084	1.317
500	1.881	7.431	5.485	2.839	1.93	2.835
630	4.005	11.21	13.56	6.65	1.72	4.667
800	8.639	27.03	21.12	12.52	3.382	7.966
1000	14.63	17.73	11.95	15.63	5.592	9.536
1250	6.721	9.281	11.61	2.275	3.896	3.329
ahw	**1.849**	**2.948**	**1.75**	**1.9**	**3.0**	**2.0**
av		**3.9**			**4.0**	







MainID: 1390, ResultsID: 10016

LocationName: [redacted]

Occupation: Grounds Maintenance
Process: Cutting thin shrub
RecordDate: October 20, 2010

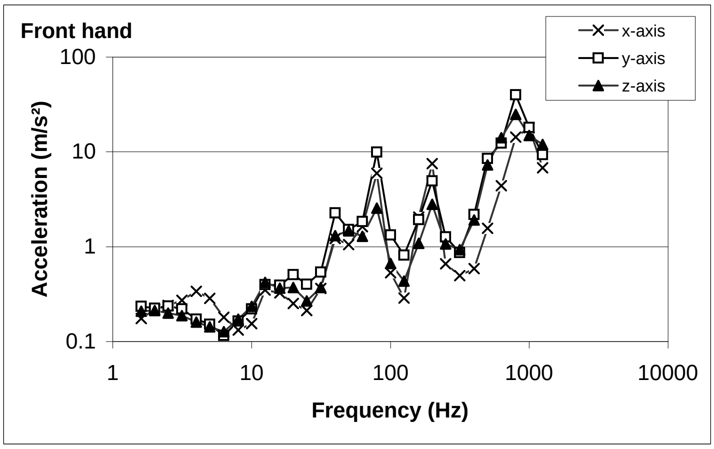
TapeNumber: N/A
Operator#: OP#2
Horizontal operation
VideoNumber: N/A

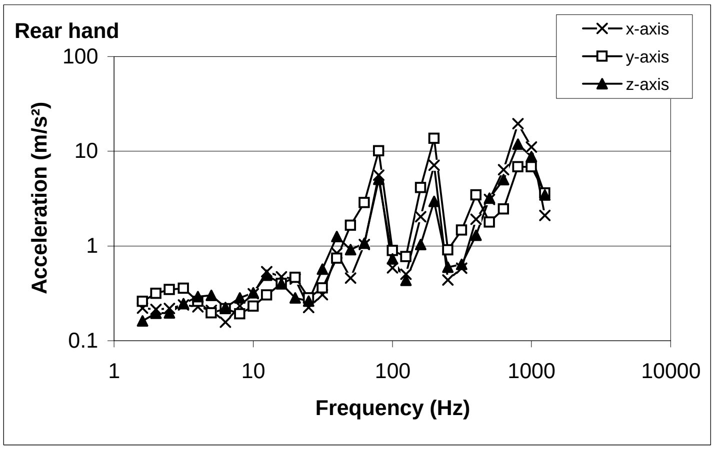
Notes:

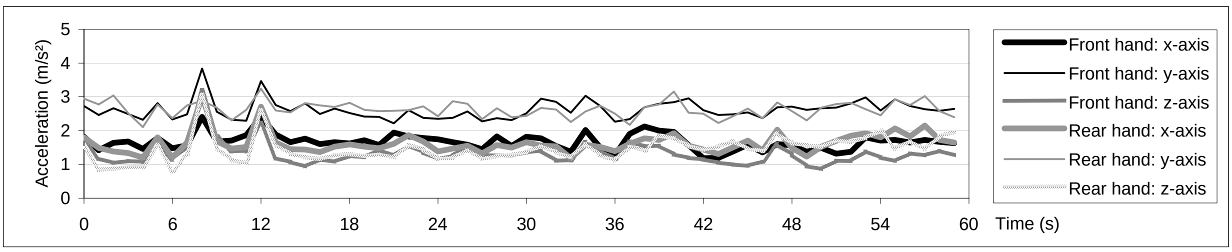
DC-shift threshold: 10 mm

MachineManufacturer: [redacted]
MachineModel:
HSLAnonymisedToolLetter: Machine D
MachineModifications:
MachineSize: 735mm blade
MainID: 1390
MachineWeight(kg): 6.3
ResultsID: 10017
MachineOperating pressure:
MachineSpeed(impacts/min):
MachineSpeed(revs/min):
MachinePower:
MachinePower source: 2 stroke oil mix
MeasurementTime: 60.25 Seconds
NumShotsInMeas:
InsertedTool:
DailyExposureTime:
InsertedToolType:
A(8) Front hand m/s²
InsertedToolManufacturer: [redacted]

	Front hand			Rear hand		
Frequency	x-axis	y-axis	z-axis	x-axis	y-axis	z-axis
1.6	0.175	0.235	0.21	0.221	0.26	0.162
2	0.217	0.224	0.213	0.214	0.316	0.195
2.5	0.241	0.236	0.2	0.219	0.345	0.197
3.15	0.273	0.22	0.187	0.239	0.358	0.247
4	0.339	0.172	0.161	0.228	0.26	0.293
5	0.286	0.152	0.143	0.21	0.196	0.302
6.3	0.181	0.116	0.127	0.156	0.218	0.224
8	0.132	0.164	0.172	0.234	0.192	0.283
10	0.154	0.221	0.236	0.314	0.231	0.321
12.5	0.35	0.398	0.42	0.535	0.304	0.491
16	0.326	0.394	0.365	0.473	0.403	0.399
20	0.253	0.508	0.371	0.446	0.467	0.284
25	0.213	0.402	0.268	0.224	0.283	0.262
31.5	0.362	0.54	0.373	0.307	0.361	0.568
40	1.22	2.264	1.305	0.841	0.745	1.262
50	1.052	1.517	1.467	0.46	1.653	0.915
63	1.626	1.841	1.29	1.04	2.867	1.069
80	5.935	9.919	2.545	5.594	10.11	5.048
100	0.53	1.333	0.664	0.586	0.893	0.733
125	0.287	0.814	0.433	0.505	0.774	0.433
160	2.057	1.932	1.084	2.032	4.141	1.039
200	7.493	4.931	2.798	7.145	13.71	2.971
250	0.66	1.266	1.069	0.439	0.912	0.597
315	0.495	0.868	0.927	0.585	1.476	0.642
400	0.588	2.191	1.921	1.915	3.445	1.297
500	1.565	8.532	7.279	3.092	1.782	3.209
630	4.398	12.33	14.16	6.377	2.449	5.025
800	14.38	39.83	24.96	19.63	6.843	11.89
1000	17.91	18.05	14.94	11.06	6.85	8.819
1250	6.814	9.345	11.98	2.105	3.613	3.455
ahw	**1.713**	**2.658**	**1.39**	**1.7**	**2.7**	**1.5**
av		**3.5**			**3.5**	







MainID: 1390, ResultsID: 10017

LocationName: [redacted]

Occupation: Grounds Maintenance
Process: Cutting thin shrub
RecordDate: October 20, 2010

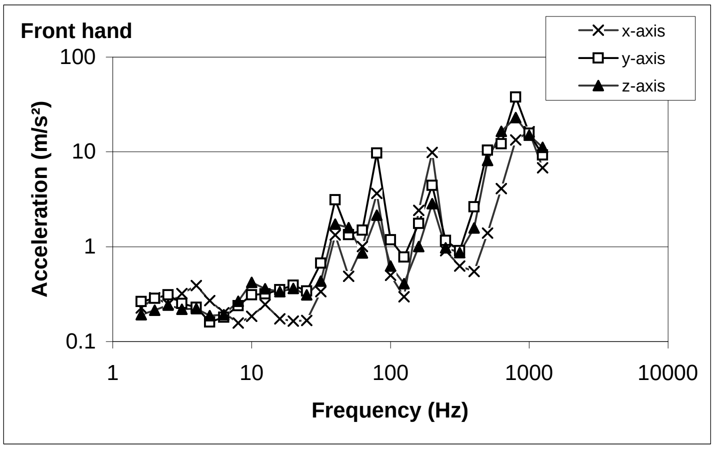
TapeNumber: N/A
Operator#: OP#3
Horizontal operation
VideoNumber: N/A

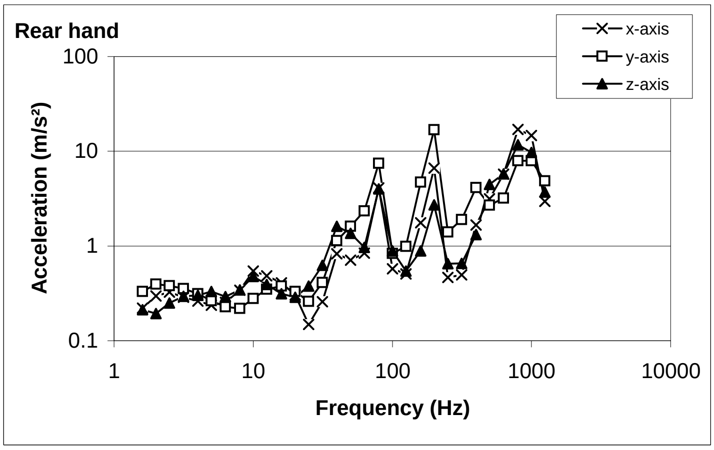
Notes:

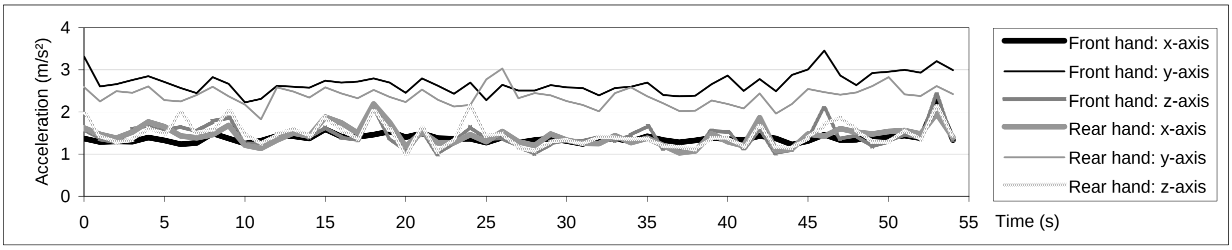
DC-shift threshold: 10 mm

MachineManufacturer: [redacted]
MachineModel:
HSLAnonymisedToolLetter: Machine D
MachineModifications:
MachineSize: 735mm blade
MachineWeight(kg): 6.3
MainID: 1390
ResultsID: 10018
MachineOperating pressure:
MachineSpeed(impacts/min):
MachineSpeed(revs/min):
MachinePower:
MachinePower source: 2 stroke oil mix
MeasurementTime: 55.25 Seconds
NumShotsInMeas:
InsertedTool:
DailyExposureTime:
InsertedToolType:
A(8) Front hand m/s²
InsertedToolManufacturer: [redacted]

	Front hand			Rear hand		
Frequency	x-axis	y-axis	z-axis	x-axis	y-axis	z-axis
1.6	0.226	0.263	0.192	0.221	0.332	0.213
2	0.29	0.285	0.214	0.298	0.396	0.194
2.5	0.249	0.31	0.243	0.326	0.381	0.25
3.15	0.321	0.252	0.218	0.289	0.356	0.295
4	0.391	0.23	0.222	0.262	0.313	0.303
5	0.271	0.161	0.187	0.237	0.265	0.332
6.3	0.201	0.18	0.192	0.254	0.228	0.293
8	0.157	0.239	0.267	0.341	0.219	0.343
10	0.184	0.311	0.422	0.543	0.28	0.477
12.5	0.247	0.318	0.36	0.485	0.35	0.391
16	0.173	0.353	0.336	0.407	0.378	0.313
20	0.165	0.393	0.362	0.303	0.331	0.287
25	0.167	0.343	0.312	0.149	0.259	0.376
31.5	0.336	0.672	0.434	0.257	0.412	0.624
40	1.328	3.137	1.733	0.829	1.141	1.609
50	0.487	1.342	1.595	0.711	1.62	1.359
63	1.004	1.49	0.858	0.839	2.352	0.964
80	3.651	9.714	2.154	4.099	7.442	4.007
100	0.501	1.184	0.627	0.576	0.835	0.885
125	0.296	0.776	0.407	0.509	0.987	0.545
160	2.418	1.758	1.008	1.757	4.719	0.889
200	9.876	4.423	2.849	6.619	16.82	2.719
250	0.905	1.166	0.977	0.467	1.4	0.648
315	0.627	0.907	0.866	0.496	1.903	0.656
400	0.547	2.639	1.582	1.663	4.147	1.321
500	1.398	10.4	8.149	3.146	2.707	4.475
630	4.094	12.16	16.49	5.719	3.191	5.79
800	13.34	37.91	22.95	16.95	7.959	11.75
1000	16.31	15.7	15	14.67	7.949	9.723
1250	6.811	9.312	11.18	2.971	4.86	3.713
ahw	**1.42**	**2.731**	**1.483**	**1.5**	**2.4**	**1.5**
av		**3.4**			**3.2**	



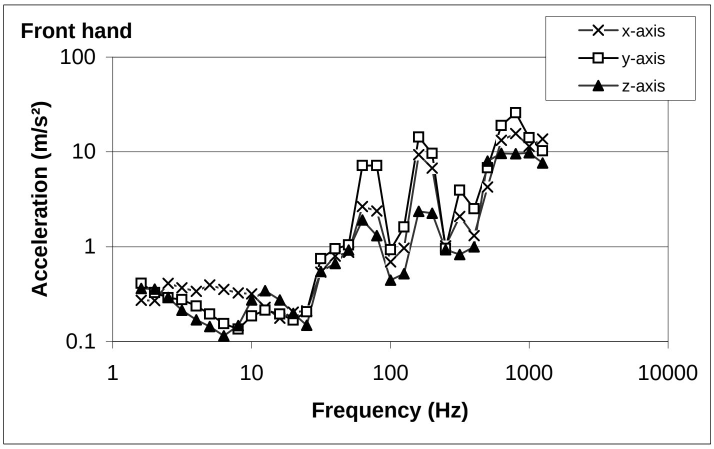


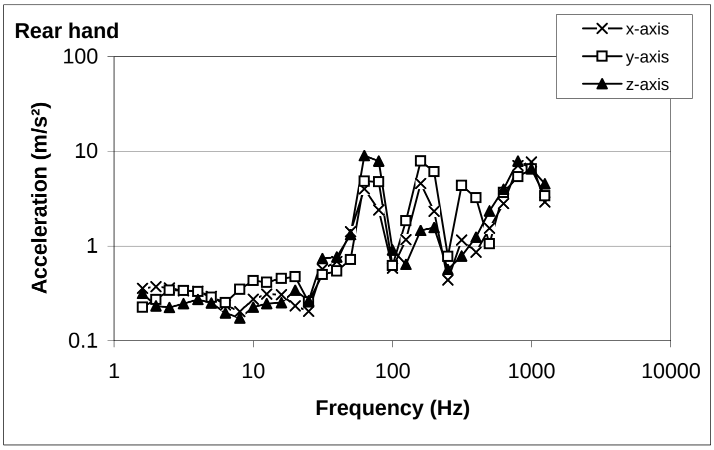


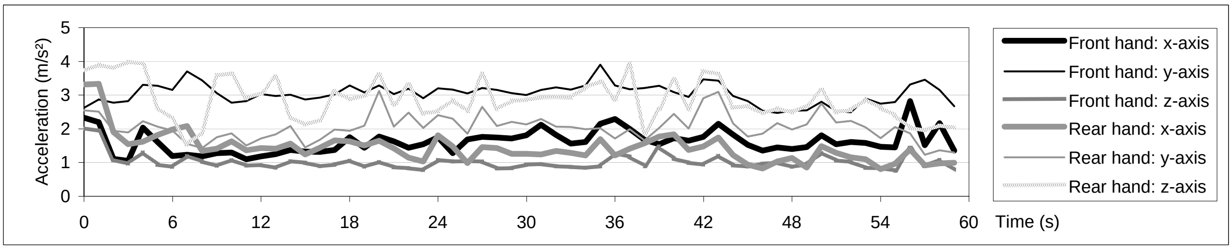
MainID: 1390, ResultsID: 10018

LocationName:	[redacted]	MachineManufacturer: MachineModel:	[redacted]
Occupation:	Grounds Maintenance	HSLAnonymisedToolLetter:	Machine D
Process:	Cutting conifer	MachineModifications:	
RecordDate:	October 20, 2010	MachineSize:	735mm blade
		MainID:	1391
		MachineWeight(kg):	6.3
		ResultsID:	10019
TapeNumber:	N/A	MachineOperating pressure:	
Operator#:	OP#1 Vertical operation	MachineSpeed(impacts/min): MachineSpeed(revs/min):	
VideoNumber:	N/A	MachinePower:	
		MachinePower source:	2 stroke oil mix
		MeasurementTime:	60.5 Seconds
Notes:		NumShotsInMeas:	
		InsertedTool:	
		DailyExposureTime:	
DC-shift threshold:	*10 mm*	InsertedToolType:	
		A(8) Front hand	m/s²
		InsertedToolManufacturer:	[redacted]

	Front hand			Rear hand		
Frequency	x-axis	y-axis	z-axis	x-axis	y-axis	z-axis
1.6	0.273	0.412	0.364	0.357	0.225	0.317
2	0.27	0.328	0.359	0.37	0.273	0.233
2.5	0.41	0.291	0.292	0.36	0.342	0.224
3.15	0.368	0.277	0.214	0.337	0.338	0.246
4	0.338	0.237	0.17	0.334	0.33	0.273
5	0.395	0.195	0.144	0.295	0.288	0.251
6.3	0.355	0.155	0.115	0.239	0.252	0.197
8	0.326	0.135	0.148	0.202	0.348	0.173
10	0.319	0.186	0.274	0.275	0.43	0.227
12.5	0.23	0.214	0.344	0.311	0.414	0.246
16	0.176	0.195	0.275	0.307	0.455	0.253
20	0.205	0.168	0.198	0.234	0.473	0.341
25	0.211	0.207	0.148	0.204	0.256	0.265
31.5	0.541	0.75	0.546	0.57	0.501	0.739
40	0.794	0.952	0.668	0.686	0.543	0.767
50	0.871	1.042	0.922	1.417	0.719	1.315
63	2.662	7.201	1.915	3.998	4.818	8.969
80	2.38	7.159	1.311	2.407	4.744	7.903
100	0.691	0.928	0.446	0.583	0.62	0.912
125	0.969	1.614	0.521	1.164	1.845	0.641
160	9.331	14.39	2.359	4.59	7.85	1.463
200	6.76	9.633	2.264	2.324	6.115	1.562
250	1.019	0.957	0.93	0.436	0.779	0.567
315	2.092	3.934	0.825	1.158	4.363	0.783
400	1.305	2.519	0.994	0.86	3.23	1.236
500	4.259	6.815	8.006	1.538	1.056	2.344
630	13.29	19.02	9.645	2.808	3.692	3.99
800	15.6	25.84	9.556	7.049	5.392	7.875
1000	11.44	14.08	9.766	7.69	6.487	6.555
1250	13.67	10.25	7.638	2.908	3.38	4.548
ahw	**1.692**	**3.075**	**1.07**	**1.5**	**2.1**	**3.0**
av		**3.7**			**3.9**	



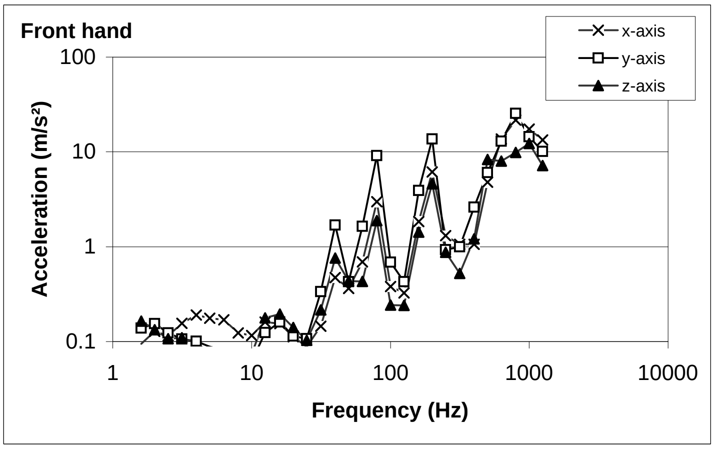


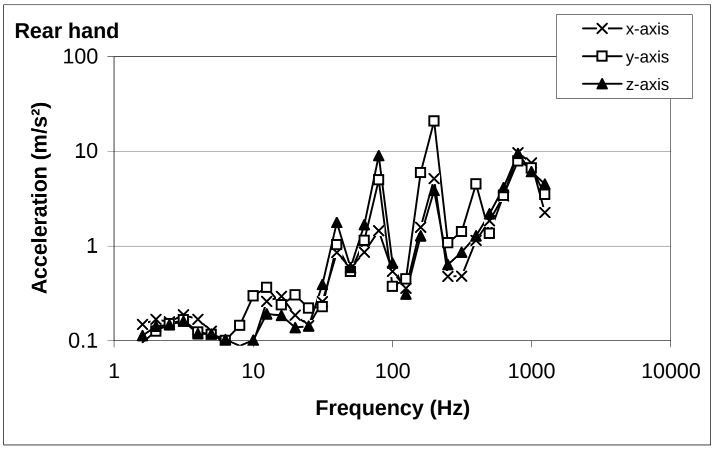


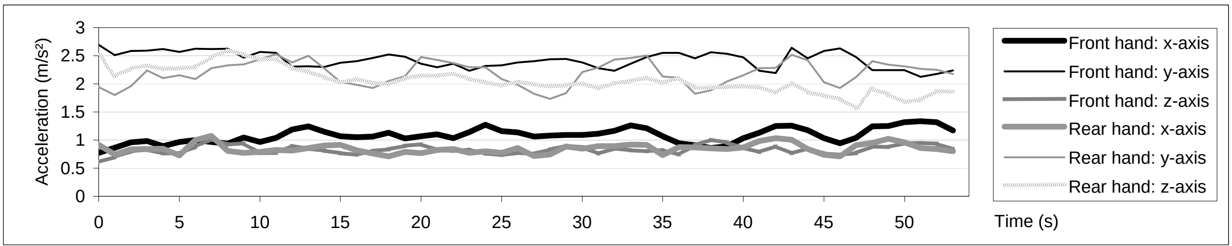
MainID: 1391, ResultsID: 10019

LocationName:		MachineManufacturer:	
		MachineModel:	
Occupation:	Grounds Maintenance	HSLAnonymisedToolLetter:	Machine D
Process:	Cutting conifer	MachineModifications:	
RecordDate:	October 20, 2010	MachineSize:	735mm blade
		MainID:	1391
		MachineWeight(kg):	6.3
		ResultsID:	10020
TapeNumber:	N/A	MachineOperating pressure:	
Operator#:	OP#2	MachineSpeed(impacts/min):	
	Vertical operation	MachineSpeed(revs/min):	
VideoNumber:	N/A	MachinePower:	
		MachinePower source:	2 stroke oil mix
		MeasurementTime:	54 Seconds
Notes:		NumShotsInMeas:	
		InsertedTool:	
		DailyExposureTime:	
DC-shift threshold:	*10 mm*	InsertedToolType:	
		A(8) Front hand	m/s²
		InsertedToolManufacturer:	

	Front hand			Rear hand		
Frequency	x-axis	y-axis	z-axis	x-axis	y-axis	z-axis
1.6	0.095	0.139	0.165	0.148	0.096	0.113
2	0.129	0.154	0.134	0.169	0.126	0.142
2.5	0.115	0.124	0.108	0.159	0.151	0.148
3.15	0.156	0.106	0.11	0.188	0.165	0.161
4	0.19	0.101	0.096	0.169	0.123	0.118
5	0.177	0.088	0.077	0.126	0.117	0.118
6.3	0.17	0.082	0.06	0.089	0.101	0.103
8	0.124	0.071	0.051	0.077	0.145	0.089
10	0.116	0.062	0.074	0.095	0.296	0.101
12.5	0.161	0.124	0.177	0.26	0.365	0.191
16	0.155	0.16	0.195	0.293	0.239	0.185
20	0.113	0.114	0.141	0.187	0.304	0.138
25	0.088	0.107	0.103	0.144	0.221	0.143
31.5	0.145	0.335	0.216	0.257	0.227	0.393
40	0.472	1.688	0.762	0.855	1.032	1.769
50	0.363	0.427	0.436	0.583	0.536	0.593
63	0.694	1.645	0.43	0.862	1.146	1.677
80	2.984	9.163	1.881	1.447	4.997	8.98
100	0.381	0.688	0.242	0.54	0.375	0.662
125	0.327	0.429	0.241	0.357	0.448	0.311
160	1.844	3.902	1.424	1.575	5.935	1.28
200	6.143	13.63	4.621	5.142	20.84	3.87
250	1.307	0.931	0.875	0.477	1.075	0.634
315	1.063	0.998	0.523	0.479	1.418	0.863
400	1.058	2.611	1.207	1.15	4.502	1.281
500	4.777	6.027	8.334	1.839	1.357	2.187
630	13.71	12.95	8.02	3.375	3.438	4.142
800	21.6	25.52	9.892	9.619	7.86	9.489
1000	17.46	14.45	12.24	7.533	6.659	6.091
1250	13.32	10.11	7.191	2.257	3.508	4.518
ahw	**1.105**	**2.448**	**0.845**	**0.9**	**2.2**	**2.1**
av		**2.8**			**3.2**	



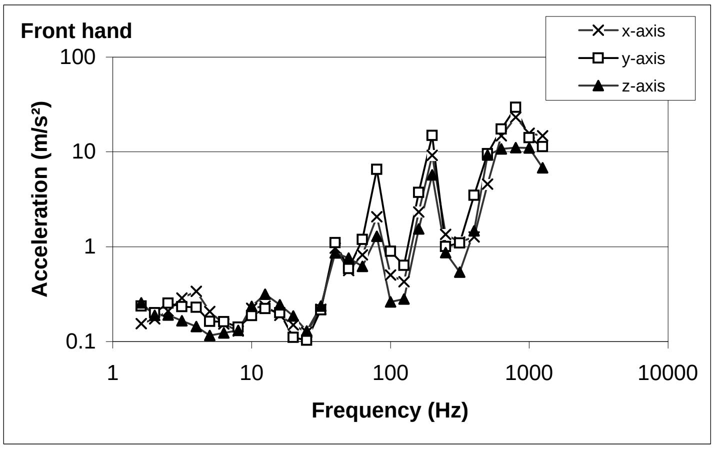


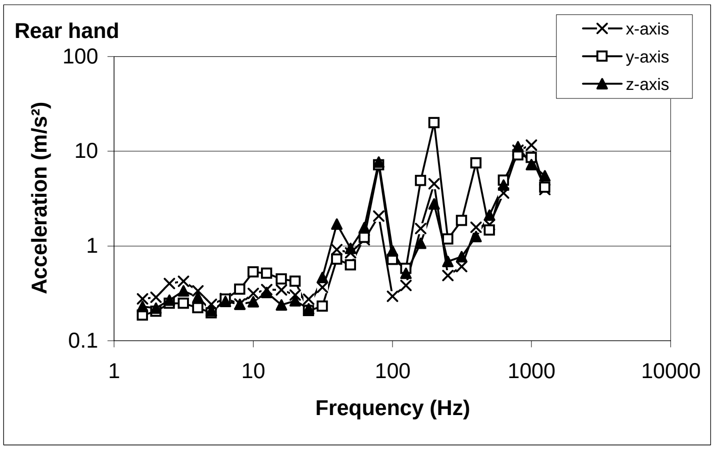


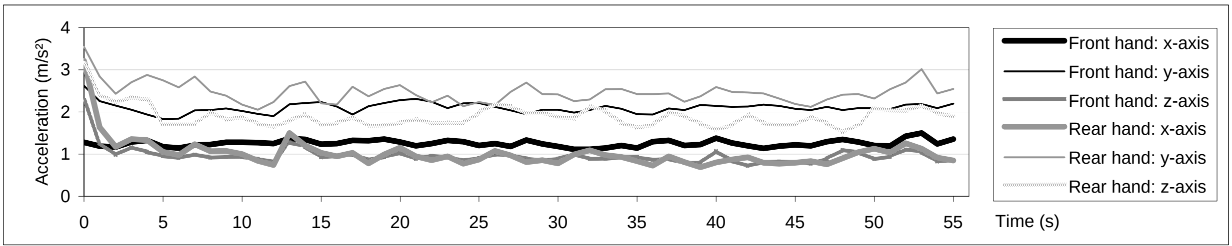
MainID: 1391, ResultsID: 10020

LocationName:		MachineManufacturer:	
		MachineModel:	
Occupation:	Grounds Maintenance	HSLAnonymisedToolLetter:	Machine D
Process:	Cutting conifer	MachineModifications:	
RecordDate:	October 20, 2010	MachineSize:	735mm blade
		MainID:	1391
		MachineWeight(kg):	6.3
		ResultsID:	10021
TapeNumber:	N/A	MachineOperating pressure:	
Operator#:	OP#3	MachineSpeed(impacts/min):	
	Vertical operation	MachineSpeed(revs/min):	
VideoNumber:	N/A	MachinePower:	
		MachinePower source:	2 stroke oil mix
		MeasurementTime:	56.25 Seconds
Notes:		NumShotsInMeas:	
		InsertedTool:	
		DailyExposureTime:	
DC-shift threshold:	*10 mm*	InsertedToolType:	
		A(8) Front hand	m/s²
		InsertedToolManufacturer:	

	Front hand			Rear hand		
Frequency	x-axis	y-axis	z-axis	x-axis	y-axis	z-axis
1.6	0.154	0.237	0.257	0.277	0.186	0.23
2	0.174	0.201	0.189	0.289	0.204	0.221
2.5	0.209	0.253	0.19	0.402	0.248	0.267
3.15	0.288	0.233	0.165	0.424	0.248	0.336
4	0.338	0.229	0.144	0.335	0.223	0.287
5	0.207	0.163	0.116	0.243	0.197	0.208
6.3	0.153	0.162	0.123	0.278	0.275	0.261
8	0.129	0.142	0.131	0.243	0.351	0.242
10	0.225	0.188	0.235	0.315	0.532	0.258
12.5	0.236	0.223	0.316	0.345	0.516	0.324
16	0.189	0.201	0.245	0.344	0.449	0.239
20	0.15	0.111	0.186	0.304	0.423	0.264
25	0.125	0.103	0.13	0.275	0.208	0.218
31.5	0.219	0.216	0.237	0.366	0.231	0.465
40	0.963	1.104	0.858	0.915	0.726	1.709
50	0.559	0.588	0.762	0.844	0.629	0.945
63	0.823	1.19	0.623	1.162	1.232	1.565
80	2.068	6.529	1.291	2.07	7.193	7.705
100	0.502	0.892	0.261	0.295	0.718	0.89
125	0.427	0.634	0.281	0.384	0.578	0.514
160	2.333	3.751	1.539	1.53	4.919	1.073
200	9.193	14.95	5.72	4.541	20.06	2.786
250	1.352	1.008	0.866	0.486	1.187	0.686
315	1.124	1.097	0.54	0.609	1.858	0.769
400	1.274	3.495	1.476	1.579	7.544	1.26
500	4.576	9.538	9.261	1.681	1.474	2.113
630	14.76	17.39	10.76	3.618	4.951	4.391
800	23.14	29.45	11.09	10.26	9.13	11.15
1000	15.68	14.15	11.03	11.63	8.551	7.246
1250	14.78	11.4	6.789	3.942	4.18	5.491
ahw	**1.282**	**2.123**	**1.004**	**1.1**	**2.5**	**1.9**
av		**2.7**			**3.4**	







MainID: 1391, ResultsID: 10021

Health and Safety Executive

Hand-arm vibration of horticultural machinery

Part 2

In recent years there have been many cases of HAVS being reported for people who work in agriculture, horticulture and landscape gardening. HSE/HSL does not currently hold much information on vibration exposures in these areas of work.

The work described in this report assesses the standard test for hedge trimmers defined in BS EN ISO 10517:2009 for repeatability and ease of use and where possible for reproducibility (by comparing machine manufacturers' declared vibration against HSL measurements to the same standardised procedures). It also assesses the validity of the measurement techniques adopted in the vibration emission test, investigates some of the factors which are likely to influence the results of the test and compares the vibration emission values with vibration magnitudes measured under real operating conditions.

The report concludes that for three of the four hedge trimmers the vibration emissions slightly overestimate the upper quartile. For the fourth hedge trimmer the upper quartile is overestimated by approximately 50%. Placing of the vibration emissions during normal intended use of the machinery in satisfactory rank order cannot be assured by comparing the vibration emissions determined according to the test code, BS EN ISO 10517:2009. The test code inconsistently represents workplace vibration.

This report and the work it describes were funded by the Health and Safety Executive (HSE). Its contents, including any opinions and/or conclusions expressed, are those of the authors alone and do not necessarily reflect HSE policy.

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