

# Report

Project: **Grinding and Cutting system**

Subject: **Noise**

Title: **Measuring report**

Client: **Safety Tools Allmet AS**

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Summary:

Grinding wheel (No. A-0500) for removing of paint with motor FUJI 10x51 (1000 rpm):  
 Averaged A-weighted sound pressure level at 1m distance from grinder removing paint from 10 mm thick sheet of Carbon steel st 52 has been measured to 81 dBA.

Grinding wheel (No. A-0500) for removing of paint with motor FUJI 10x51 (1000 rpm):  
 Averaged A-weighted sound pressure level at 1m distance from grinder removing paint from 10 mm thick sheet of Stainless steel 316 has been measured to 85 dBA.

Grinding wheel (No. A-0502) for removing of welding seam with motor Atlas Copco LSV 28 STO 08-01 (800) rpm:  
 Averaged A-weighted sound pressure level at 1m distance from grinder removing welding seam from 10 mm thick sheet of Carbon steel st 52 has been measured to 84 dBA.

Cutting for steel (No A-0504) with motor Atlas Copco LSV 28 STO 08-01 (800) rpm:  
 Averaged A-weighted sound pressure level at 1m distance from cutting machine cutting a 10 mm thick sheet of Carbon steel st 52 has been measured to 85 dBA.

Cutting for steel (No A-0504) with motor Atlas Copco LSV 28 STO 08-01 (800) rpm:  
 Averaged A-weighted sound pressure level at 1m distance from cutting machine cutting a 10 mm thick sheet of Stainless steel 316 has been measured to 88 dBA.

The measurements have been executed outdoors under free field conditions. If similar measurements should be executed within doors the results of the measurements will be dependent upon the room acoustical conditions in the very room. For example, premises with hard, sound reflecting surfaces will cause louder sound pressure levels from the activity than present report reveals.

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## 1. The Task

Multiconsult AS in Bergen has, on request of Safety Allmet Tools AS by Reidar Olsen, carried out measurements of noise from a grinding and cutting system, developed by Safety Tools Allmet AS.

The measurements were executed on the 18<sup>th</sup> of June 2007 by Specialist Engineer, M.Sc. Acoustics Ingrid Holst.

## 2. Measuring Standard

The measurements of sound pressure level and the determination of sound power level have been executed and evaluated in accordance with the Norwegian Standard NS-EN ISO 3746 "Determination of sound power levels of noise sources. Survey method using a reference sound source," revision 1995.

## 3. Definitions

$L_p$  : Sound Pressure Level (dB) is defined as  $20 \log (p/p_0)$  where  $p$  is the measured sound pressure in  $N/m^2$  and  $p_0$  is the reference sound pressure of  $2 \times 10^{-5} N/m^2$  (Pa).

$L_w$  : Sound Power Level (dB) is defined as  $10 \log (w/w_0)$  where  $w$  is the sound power in Watts, and  $w_0$  is the reference sound power of  $10^{-12}$  Watt.

A-weighting:  $L_p$  (or  $L_w$ ), in dBA:  
The  $L_p$  (or  $L_w$ ) with the weighting network specified in IEC pub. 651 incorporated. The "A" weighting function simulates the response of the human ear under normal working conditions.

Daily noise exposure level:  $L_{EX,8h}$  (dBA), time-weighted average of the noise exposure levels for a normal eight-hour working day as defined by international standard ISO 1999:1990, point 3.6. It covers all noises present at work, including impulsive noise.

Peak sound pressure:  $L_{pC,peak}$  (dBC), maximum value of the C- weighted instantaneous noise pressure measured within the measuring period.

Exposure limit values: Noise exposure values that are not to be exceeded.

Exposure action values: Noise exposure values that demands effectuation of action to reduce the health risk and damaging strain to a minimum.

## 4. Requirements

### Off shore

In accordance with the Norsok Standard S-002 “Working environment” revision 4 2004 the noise exposure of an individual worker within a 12 hours working day,  $L_{Aeq, 12 \text{ hours}}$  should be maximum 83 dBA. The maximum value of the instantaneous noise pressure is 130 dBC.

### On shore

In accordance with the Norwegian law of the Working environment requirements of noise on the place of work are given in “Forskrift om vern mot støy på arbeidsplassen” rev. 2.5.2006. The directions state both values of action and values of limits to noise exposure, see table 1.

Table 1 : Values of action and values of limits to noise exposure.

Noise exposure	Lower exposure action value:	Upper exposure action value:	Limit exposure value:
Level of daily noise exposure, $L_{EX,8h}$	80 dBA	85 dBA	85 dBA
Top level of sound pressure level, $L_{pC,peak}$			130 dBC

### 4.1 Actions

The employer must effectuate necessary actions based upon the health- and security risks appearing from the risk evaluation. The employer shall among other factors see to that risks caused by noise will be removed or reduced to lowest possible level, by :

- a) considering alternative working methods giving reduced noise exposure,
- b) choosing practical working equipment giving as little as possible noise,
- c) designing and organizing the working place and the working areas, for instance by arranging and using the technical devices in such a way that unnecessary noise does not appear,
- d) carrying out technical noise-reduction that reduces sound spreading through air, for instance by using screens, enclosures or sound absorbers,
- e) making technical noise-reduction that reduces structure borne sound and vibrations by equilibrate, dampen or isolate sound sources,
- f) having systematically maintenance of working equipment, the working place, and the noise reducing actions,
- g) organizing the work by limitation of exposure time and intensity, and by adequate noise-free resting periods,
- h) seeing to that health examinations are executed.

The employer shall accommodate the actions for employees that particularly can be exposed to accident- or health danger.

#### 4.2 Distinct actions by excess of the exposure action values

If lower exposure action value, or upper exposure action value of the top level of sound pressure level, is exceeded, the employer shall:

- a) consider technical or administrative actions to reduce the noise exposure and carry out plans for actions in writing.
- b) dispose hearing protection when  $L_{EX,8h} = 80$  dBA is exceeded or the employee perceives the sound level annoying.

### 5. Measuring Conditions

Background noise was too low to interfere with the measured values, more than 10 dB below the dominating frequency intervals.

Measuring time interval: from 10.00 to 12.00. No wind, sunlight, clear, + 18 °C.

### 6. Measuring Equipment

The measurements were executed with the following instrumentation setup:

Sound analyzer:	Brüel & Kjaer Type 2260
Microphone:	Brüel & Kjaer Type 4189
Calibrator:	Brüel & Kjaer Type 4230

The sound pressure levels were measured in 1/1-octave band. The sound analyzer was calibrated in accordance with manufacture procedures before and after the measurements was executed.

### 7. Measuring Procedure

Measuring of equivalent sound pressure level with measuring time interval of 30-60 seconds in five different points was executed. The measuring points were spread over an imaged, surrounding box at a distance of 1 m from the cutting system at work. The positions of microphone were at level 1 m above the ground around the grinding- and cutting system, and at 1 m distance directly above the grinding- and cutting system, see sketch in appendix 1.

Equivalent sound pressure level was measured in octave band intervals from 31.5 - 8000 Hz.

### 8. Sound Sources

- 1: Grinding wheel for removing of paint (No A-0500) with motor FUJI 10x51, 1000 rpm, Carbon steel st 52
- 2: Grinding wheel for removing of paint (No A-0500) with motor FUJI 10x51, 1000 rpm, Stainless steel 316
- 3: Grinding wheel for removing welding seam (No A-0502) with motor Atlas Copco LSV 28 STO 08-01, 800 rpm, Carbon steel st 52
- 4: Cutting for steel (No A-0504) with motor Atlas Copco LSV 28 STO 08-01, 800 rpm, Carbon steel st 52
- 5: Cutting for steel (No A-0504) med motor Atlas Copco LSV 28 STO 08-01, 800 rpm, Stainless steel 316

Pieces of metal tooled by the different systems were mounted on pallets placed outdoors at an asphalt-covered area, in sufficient distance (> 10 m) from potential reflecting, vertical surfaces. See pictures in appendix 2.

## 9. Measuring Results

In table 2 averaged A-weighted sound pressure level over a measuring surface at a distance of 1 m from the grinding- and cutting system is summed up. In appendix 3 measuring results at frequency level and results of calculation are shown. The measuring points are shown in appendix 1.

*Table 2: Measured, corrected sound pressure level at distance of 1 meter, freefield conditions*

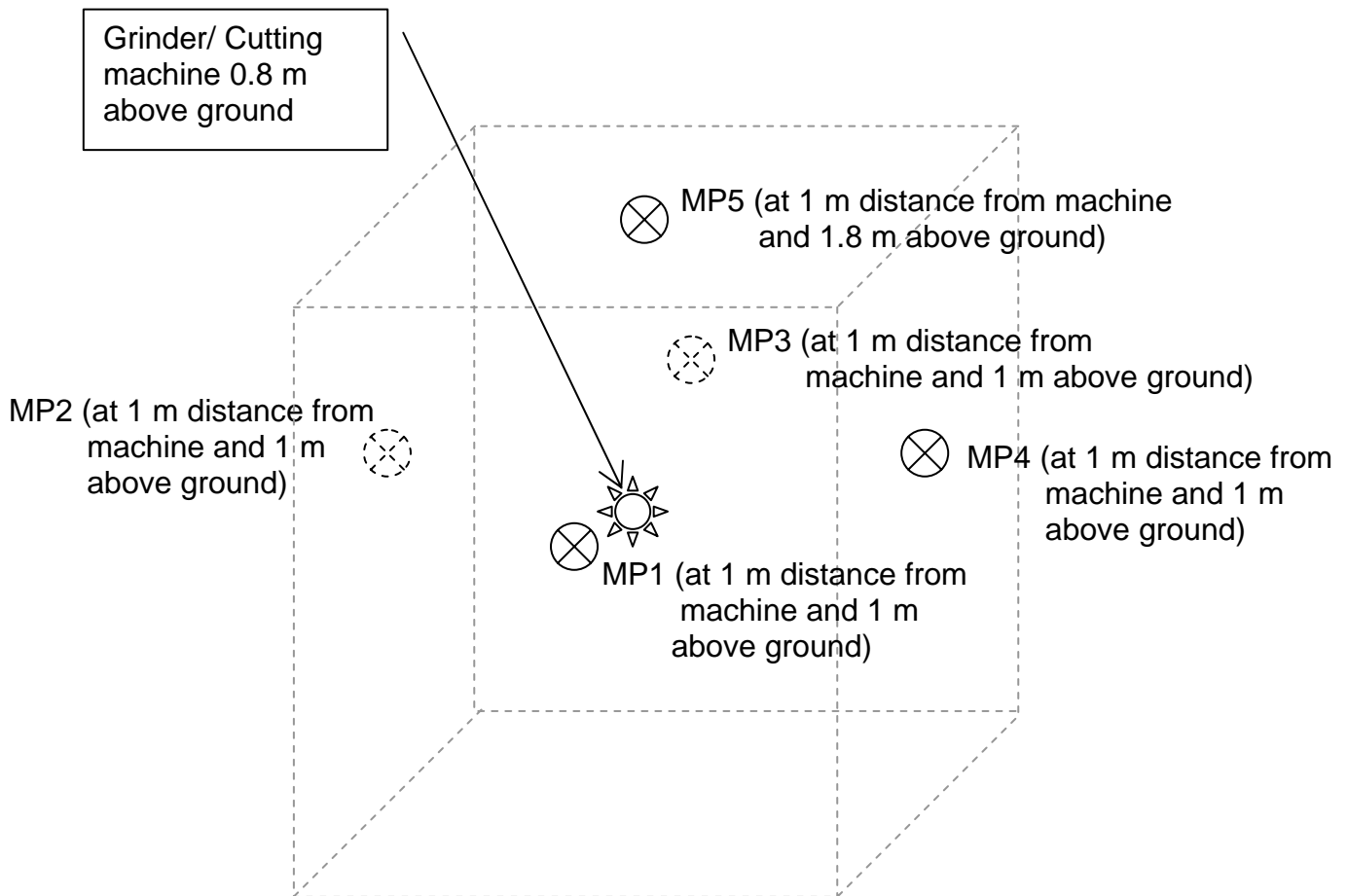
<b>Tools:</b>	<b>Averaged sound pressure level at 1 m distance from machine free field conditions in accordance with NS-EN ISO 3746<sup>1</sup>.</b>	<b>Working process:</b>
Grinding wheel (No. A-0500) for removing of paint with motor FUJI 10x51 (1000 rpm)	81 dBA	Removing paint on a 10 mm thick sheet of Carbon steel st 52
Grinding wheel (No. A-0500) for removing of paint with motor FUJI 10x51 (1000 rpm)	85 dBA	Removing paint on a 10 mm thick sheet of Stainless steel 316
Grinding wheel (No. A-0502) for removing of welding seam with motor Atlas Copco LSV 28 STO 08-01(800) rpm	84 dBA	Removing welding seam on a 10 mm thick sheet of Carbon steel st 52
Cutting for steel (No A-0504) with motor Atlas Copco LSV 28 STO 08-01 (800) rpm	85 dBA	Cutting of a 10 mm thick sheet of Carbon steel st 52
Cutting for steel (No A-0504) with motor Atlas Copco LSV 28 STO 08-01 (800) rpm	88 dBA	Cutting of a 10 mm thick sheet of Stainless steel 316

## 10. Comments

The measurements have been executed outdoors under free field conditions. If similar measurements should be executed within doors the results of the measurements will be dependent upon the room acoustical conditions in the very room. For example, premises with hard, sound reflecting surfaces will cause louder sound pressure levels from the activity than present report reveals.

<sup>1</sup> Norwegian Standard NS-EN ISO 3746 "Determination of sound power levels of noise sources. Survey method using a reference sound source," revision 1995.

Measuring points around Grinder- and Cutting machine



Fotos





Measuring poin	31.5 Hz	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz	dBA	Process:
1	59,8	63,5	61,2	61,5	72,2	74	74	74,2	69,2	80,3	3
2	60,7	63,4	55	61,7	76,3	78	79,3	74,9	70,2	83,9	3
3	61,1	62,9	61,3	63,8	79,4	80,6	80,6	80,2	72,1	86,6	3
4	60,8	62,1	51,8	54,9	69,9	75,7	75,6	76,6	71,8	82,2	3
5	61,9	64,8	63,5	68,9	75,2	77,5	77,8	72,5	67,2	82,6	3
<b>Averaged A-weighted sound pressure level at 1 m distance :</b>										<b>84</b>	
5	59,3	59,7	56	57,8	74,3	75,2	75,9	73,2	68,5	81,2	4
4	61,8	63,6	52,1	54,9	63,9	77,2	83,4	73,6	69,7	85,8	4
3	61,5	63,6	52,2	56,1	73	80,1	85,3	77	72,4	88	4
2	59,6	61,1	54,5	55,6	68,7	78,4	82,9	73,4	74,2	85,7	4
1	60,9	62,5	55,7	52,6	64,8	75,1	77,4	71,7	68,6	81,1	4
<b>Averaged A-weighted sound pressure level at 1 m distance :</b>										<b>85</b>	
1	61,2	63,1	53,7	52,4	67,5	72,5	82,2	72,4	69,1	84,3	5
2	60	67,2	54,4	58,4	69	82,5	88,7	76,1	70,9	90,8	5
3	62,9	66,1	57,5	65,2	74,3	86,6	84,7	79,3	73	90	5
4	59,9	61,9	53,2	56,4	65,5	77	81,3	76,8	70,2	84,7	5
5	64,5	62	54,3	56,8	69,9	74,1	79,4	71,1	65,9	82,1	5
<b>Averaged A-weighted sound pressure level at 1 m distance :</b>										<b>88</b>	
5	61,5	62,2	57,5	66,8	70,6	72,6	75,8	73,3	72,2	80,8	2
4	60,9	64,3	54,7	65,7	74,6	78,4	79,7	77,1	82,4	86,5	2
3	59,8	61,7	57,6	64,6	68,3	80,3	80,1	78,7	82,8	87,3	2
2	58,8	61,6	59,3	66,3	67,3	74,3	81,6	75,7	78	85,1	2
1	61,1	68,2	57,1	67,2	67,8	73,2	74,4	74	77,3	81,6	2
<b>Averaged A-weighted sound pressure level at 1 m distance :</b>										<b>85</b>	
1	59,7	62,2	52,2	59,7	58,6	62,7	68,8	72,2	75,8	78,6	1
2	59,7	60,6	54,9	65,6	64	70,2	75,2	73,6	77,3	81,4	1
3	61,6	64,4	58,8	67,2	69,6	71,6	79,3	73,7	75,9	82,9	1
4	60	61,1	56,9	63,1	68	70,3	71,9	73	77,2	80,5	1
5	64,3	63,6	60	70,5	68,3	72,5	80	72,1	70,9	82,6	1
<b>Averaged A-weighted sound pressure level at 1 m distance :</b>										<b>81</b>	

Process 1: Grinding wheel for removing of paint (No A-0500) with motor FUJI 10x51. 1000 rpm, Carbon steel st 52.

Process 2: Grinding wheel for removing of paint (Nr A-0500) with motor FUJI 10x51. 1000 rpm, Stainless steel 316.

Process 3: Grinding wheel for removing welding seam (Nr A-0502) with motor Atlas Copco LSV 28 STO 08-01 800 rpm, Carbon steel st 52.

Process 4: Cutting for steel (Nr A-0504) with motor Atlas Copco LSV 28. STO 08-01 800 rpm, Carbon steel st 52.

Process 5: Cutting for steel (Nr A-0504) med motor Atlas Copco LSV 28. STO 08-01 800 rpm, Stainless steel 316.