Practical Methods for Reducing Cutting Noise Levels Using an Armorgard CuttingStation™

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Introduction

Armorgard partnered with a power tool manufacturer and with a noise testing expert from construction product distributor VJ Technology to look at practical options for reducing noise when cutting metal. In this instance the test will be carried out on M10 studding and 41 mm galvanised steel U-channel.

The reference condition was a Makita cut-off saw with a standard 78-tooth TCT metal cutting blade mounted on an open bench. This is typical of the arrangement used on site by many Mechanical and Electrical contractors.

Noise levels for around 350 cutting operations were measured at various locations around the cutting tool. Tests were carried out with and without the Armorgard CuttingStation using different cutting tools and blades.

The Armorgard CuttingStation SS7 was found to significantly reduce noise emissions in all three directions screened by the closed sides of the enclosure without increasing the noise exposure to the operator.

Optimising the power tool and blade to suit the task was also beneficial. Using a bandsaw rather than a TCT saw significantly reduced noise exposures by cutting somewhat more slowly, but much more quietly than the TCT saw. Using a higher specification TCT blade was also found to reduce noise exposures mainly by increasing the speed of the cutting operations.

Combining the benefits of the Armorgard cutting station with quieter tools gave some substantial noise level reductions.

As an example, using the Armorgard cutting station with a bandsaw rather than a TCT saw when cutting channel gave a 19 dB(A) noise reduction at 1 metre from the tool on the (closed) side opposite the tool the operator.

The measured noise level at this location decreased from 97.1 dB(A) to 77.9 dB(A). This would increase the time to reach the 80 dB(A) daily Lower Noise Exposure Action Value (LEAV) given in the Control of Noise at Work Regulations from under ten minutes to more than eight hours of continuous operation.

Note: The tables below show some of the individual measurements taken. Noise levels were recorded consecutively at each location and averaged over three cuts carried out quickly one after the other. The overall findings reported in the Conclusions are based on non-parametric statistical analysis of all measurements taken.

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Noise Level Results

Table 1 Increase in time taken to reach the LEAV calculated from measurements taken at 1 metre from the test bench

		Channel - TCT Saw	Channel - Band Saw	Stud - TCT Saw	Stud - Band Saw
OPEN BENCH	FRONT	00:15	02:39	02:34	05:00
	SIDE	00:13	01:08	01:01	01:14
	BACK	00:09	00:43	01:52	03:02
SS7	FRONT	00:12	02:23	03:24	06:48
	SIDE	01:33	03:24	05:21	>8hr
	BACK	02:12	>8hr	>8hr	>24hr
DIFFERENCE	FRONT	-00:03	-00:16	00:50	01:48
	SIDE	01:20	02:16	04:20	>8hr
	BACK	02:03	>8hr	>8hr	>8hr

Table 2 Increase in time taken to reach the LEAV calculated from measurements taken at 3 metres from the test bench

		Channel - TCT Saw	Channel - Band Saw	Stud - TCT Saw	Stud - Band Saw
OPEN BENCH	FRONT	00:28	04:09	04:51	>8hr
	SIDE	00:37	02:15	04:03	04:38
	BACK	00:47	01:47	04:57	06:27
SS7	FRONT	00:29	03:49	07:08	>8hr
	SIDE	02:08	>8h	>8hr	07:25
	BACK	02:42	>8h	>24hr	>24hr
DIFFERENCE	FRONT	00:01	-00:10	02:17	04:21
	SIDE	01:31	>7h	>8hr	>8hr
	BACK	01:55	>8hr	>8hr	>8hr

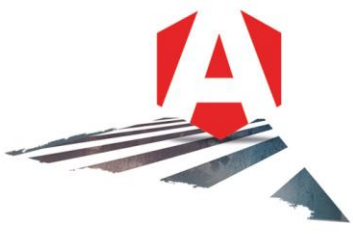

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Table 3 Noise levels measured at 1 metre from the test bench:

Noise in db(A)		**Channel - TCT Saw**	**Channel - Band Saw**	**Stud - TCT Saw**	**Stud - Band Saw**
OPEN BENCH	FRONT	95.2	84.8	84.9	82.0
	SIDE	95.5	88.5	88.9	88.1
	BACK	97.1	90.4	86.3	84.2
SS7	FRONT	96.0	85.3	83.7	80.7
	SIDE	87.1	83.7	81.8	79.5
	BACK	85.6	77.9	75.9	74.5
DIFFERENCE	FRONT	-0.8	-0.5	1.2	1.3
	SIDE	8.4	4.8	7.1	8.6
	BACK	11.5	12.5	10.4	9.7

Table 4 Noise levels measured at 3 metres from the test bench:

		Channel - TCT Saw	**Channel - Band Saw**	**Stud - TCT Saw**	**Stud - Band Saw**
OPEN BENCH	FRONT	92.4	82.8	82.2	79.2
	SIDE	91.1	85.5	83.0	82.4
	BACK	90.0	86.5	82.1	80.9
SS7	FRONT	92.2	83.2	80.5	77.6
	SIDE	85.7	79.2	76.6	80.3
	BACK	84.7	77.9	74.3	73.6
DIFFERENCE	FRONT	0.2	-0.4	1.7	1.6
	SIDE	5.4	6.3	6.4	2.1
	BACK	5.3	8.6	7.8	7.3

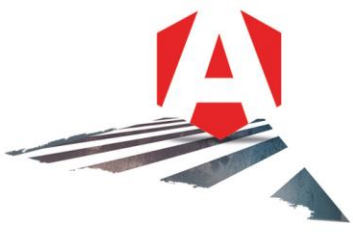

Figure 1: Comparative view of Cutting Scenarios

Conclusions from Testing

- The overall average noise levels when using the Armorgard cutting station was significantly quieter than cutting on an open bench.
- The greatest improvements were for locations at the back (closed) side of the Armorgard cutting stations.
- The noise levels at the operator generally did not decrease, but they did not generally increase either suggesting that the cutting station was successfully absorbing some of the noise rather than simply redirecting it away from the closed sides and towards the operator.
- There was no significant reduction in cutting speed when using the Armorgard cabinet compared to the open bench.
- The operator preferred the ergonomics of the SS7 cutting station over the previous design.
- Using an Armorgard cutting station, using an improved cutting blade and using an alternative cutting tool were all found to significantly reduce the noise levels in the vicinity of the cutting operation.
- For example, using the Armorgard cutting station with a bandsaw rather than a TCT saw on an open bench when cutting channel gave a 19 dB(A) noise reduction at 1metre from the tool.
- The Armorgard cutting station substantially increased the times before exposed personnel stood to the side or back of the cutting station would be expected to reach the Lower Exposure Action Value given in the Control of Noise at Work Regulations.

Disclaimer: As with all trials, the results obtained were as measured on the day with the test location, operator, cutting stations, tools and consumables tested. The results presented are believed to be representative of the conditions tested but many factors can affect noise exposure and noise emission and it is likely that the noise levels obtained on site will differ to from the results obtained in this trial.