

MEMO		
Project number 3848-017	Customer Becromal Iceland ehf	Date 15.02.2016
Project Noise measurements		
Subject Noise measurements on the Becromal production site		
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EFLA hf. has performed noise measurements on the Becromal production site at Krossanes 4 in Akureyri. The measurements were conducted by Kristín Ómarsdóttir, M.Sc. civil- and environmental engineer. The results of the noise level measurements were compared to the reference limits set in the regulation on noise nr. 724/2008. When measurements were conducted, the weather was cold, with wind speed of around 4-5 m/s.

Measurement procedure

The noise measurements were conducted according to the standard „Metod för imissionsmatning av externt industribuller“, which is a joint Nordic standard.

The equipment used for the measurement:

- Nor-118, sound level meter from Norsonic
- ½" microphone, Norsonic 1225
- ½" microphone preamplifier, Norsonic 1201/SLM
- Calibrator, Norsonic 1251
- Software for the processing of the measurements
- Wind shield for microphone

There is a continuous production in the factory day and night, so the noise level should be similar in the day-evening- and night time. The nearest residential area is at around a 400-600 m distance to the south from the factory and is mostly shielded from the factory noise by the surrounding topography. Other neighbouring areas are industrial areas and premises. Part of the Becromal factory is built on reclaimed land, or land fill. The ground was mostly snowy when the measurements were made, with snow depths of around 1 m. The measurements were made during the period from 15 – 17 p.m. on the 11. February 2016. Weather conditions can be seen in table 1.

Table 1: Meteorological data

Time	Wind speed	Max wind speed	Temperature	Precipitation	Snow depth
14:00	↙ 4 m/s	5 m/s / 8 m/s	0,0 °C	0 mm / 1 h	100 cm
15:00	↙ 4 m/s	5 m/s / 8 m/s	-0,6 °C	0 mm / 1 h	
16:00	↙ 5 m/s	5 m/s / 7 m/s	0,4 °C	0 mm / 1 h	
17:00	↙ 5 m/s	5 m/s / 9 m/s	-0,4 °C	0 mm / 1 h	
18:00	↙ 3 m/s	4 m/s / 7 m/s	-1,1 °C	0 mm / 1 h	

The sound level meter was set up in four different places, on two locations on the south-west side of the building, one location at the south-west boundary and on one location on the north-west boundary of the Becromal production site. Both the noise sources and the weather conditions were very steady, so the duration used for each measurement was around 5 min., with the microphone placed 1,5 m above ground. No noise events were observed that were not related to the Becromal factory operation. The measuring locations are marked with numbered blue circles in figure 1.



Figure 1: Four different measurement locations on the Becromal production site.

Current requirements

According to the municipal plan for Akureyri, this area is defined as a port area. In the regulation on noise nr. 724/2008, the limit for the noise level in an industrial area is $L_{Aeq} = 70$ dB(A), irrespective of the time of day. The limit in a residential area for the noise level from an industrial area is $L_{Aeq} = 50$ dB(A) in the daytime and $L_{Aeq} = 40$ dB(A) in the night time.

Measurement results

In all locations, free field values were measured as there were no relevant reflecting surfaces near the microphone except for the ground.

Location 1

The first measurement location was at the south corner of the plot. The noise from the Becromal factory was dominant and no activity unrelated to the factory could be heard.



Figure 2: First measurement location.

The measured equivalent sound level on location 1 can be seen in figure 3, and the frequency spectrum can be seen in figure 4.

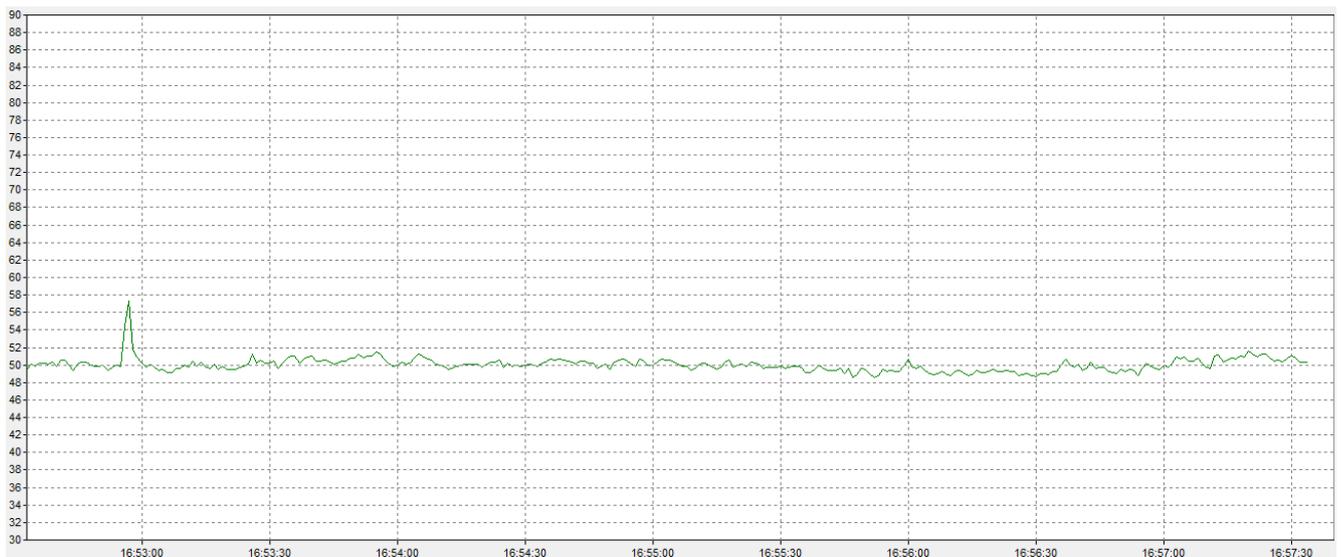


Figure 3: Measurement location 1. Equivalent sound level [dB(A)] as a function of time.

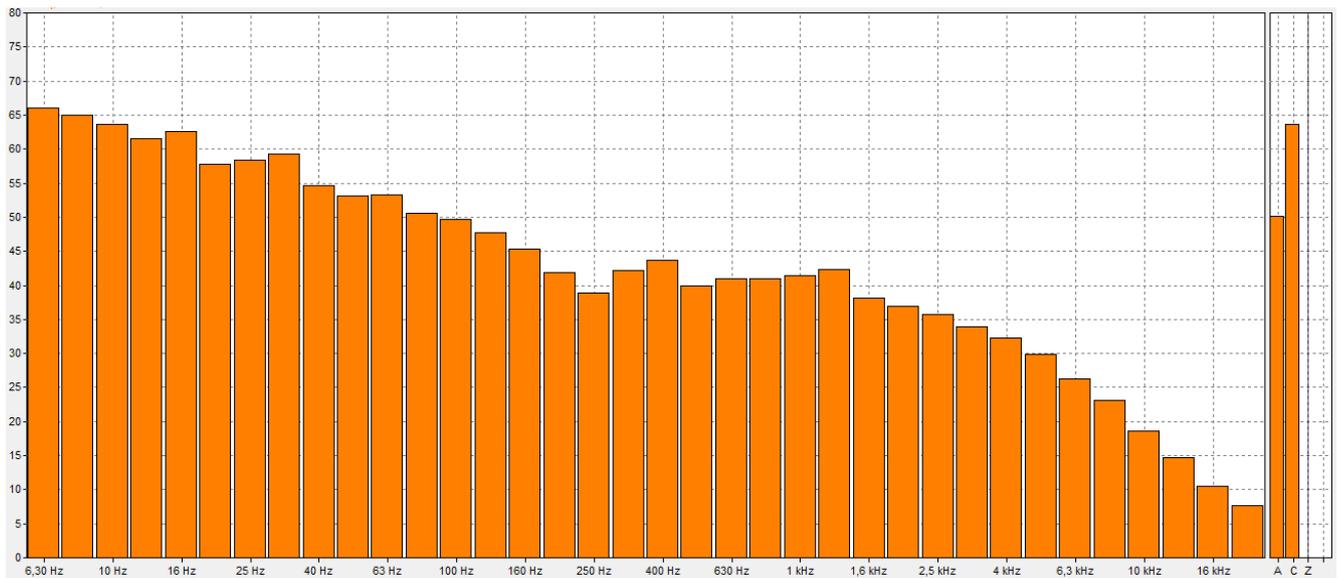


Figure 4: Measurement location 1. Equivalent sound level [dB(A)] as a function of frequency.

The effect of the wind was negligible. The noise source is quite steady, but was positioned downwind from the microphone. Low frequencies are dominant in the measured noise level in this location, as can be seen in figure 4.

Location 2

The second location can be seen in figure 5. The noise from the Becromal factory was dominant and no activity unrelated to the factory could be heard.



Figure 5: Second measurement location.

The measured equivalent sound level on location 2 can be seen in figure 6 as a function of time and in figure 7 as a function of frequency.

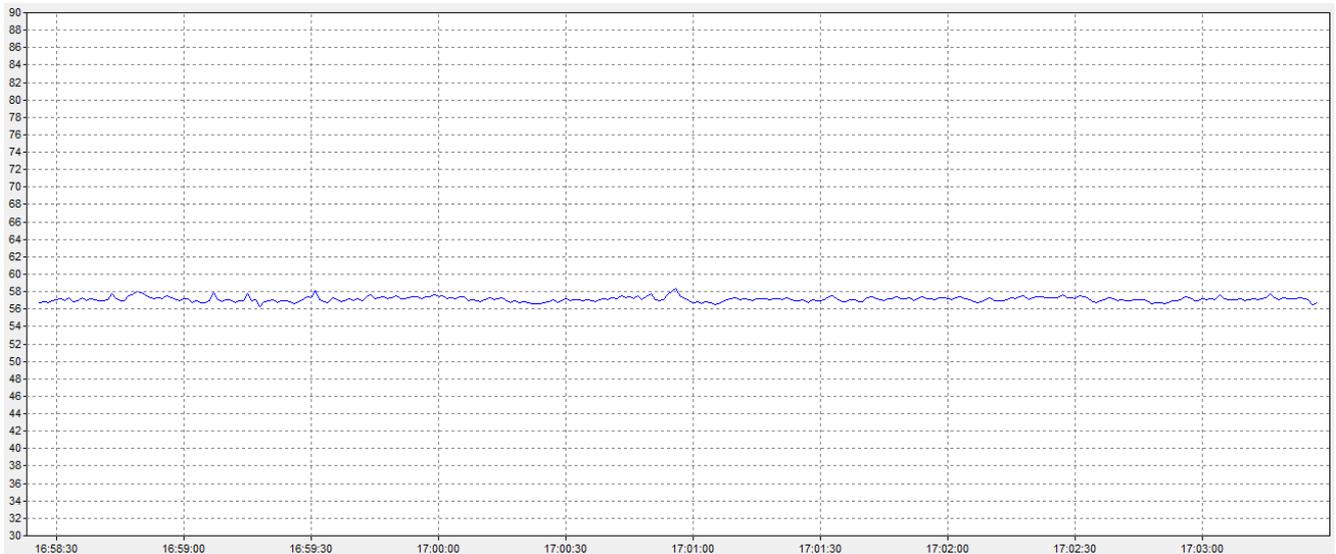


Figure 6: Measurement location 2. Equivalent sound level [dB(A)] as a function of time.

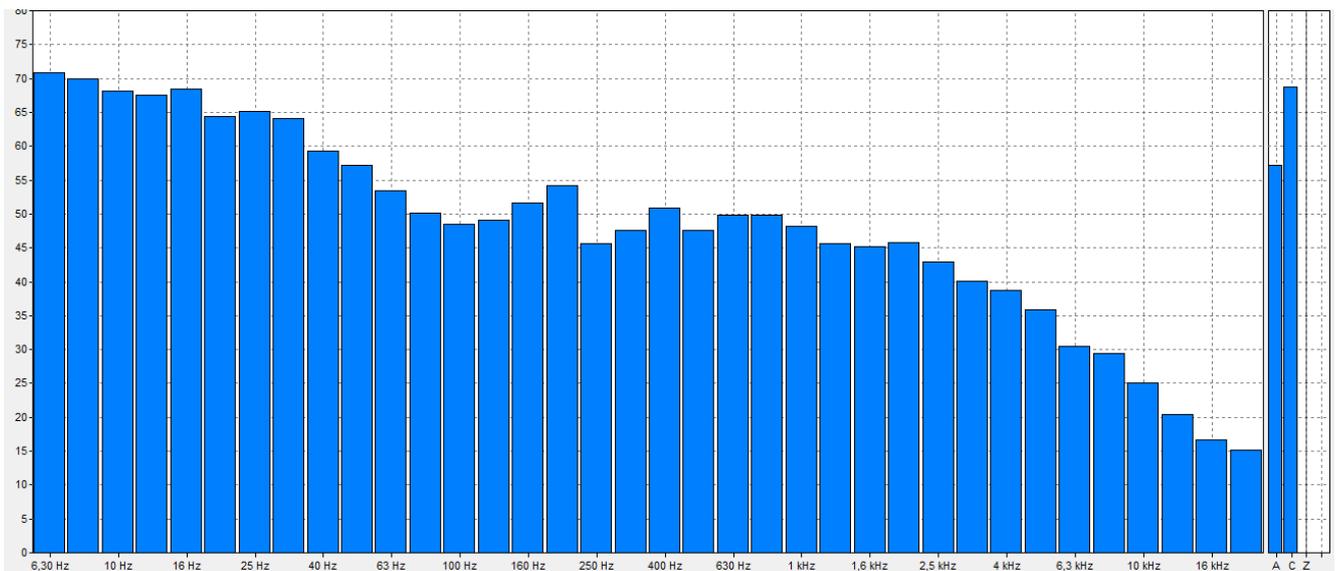


Figure 7: Measurement location 2. Equivalent sound level [dB(A)] as a function of frequency.

The effect of the wind was negligible. The noise source is quite steady. Low to mid frequencies are dominant in the measured noise level in this location, as can be seen in figure 4.

Location 3

On the third location, there was an audible tonal frequency. The frequency spectrum was measured in 1/3 octaves, which showed tonal frequencies at around 160-200 Hz and 315 Hz. The noise from the Becromal factory was dominant and no activity unrelated to the factory could be heard. In the middle of the measurement there was a forklift dumping waste into a container near the measurement equipment, which can be seen on figure 9.



Figure 8: Third measurement location.

The measured equivalent sound level on location 3 can be seen in figure 9 as a function of time and in figure 10 as a function of frequency.

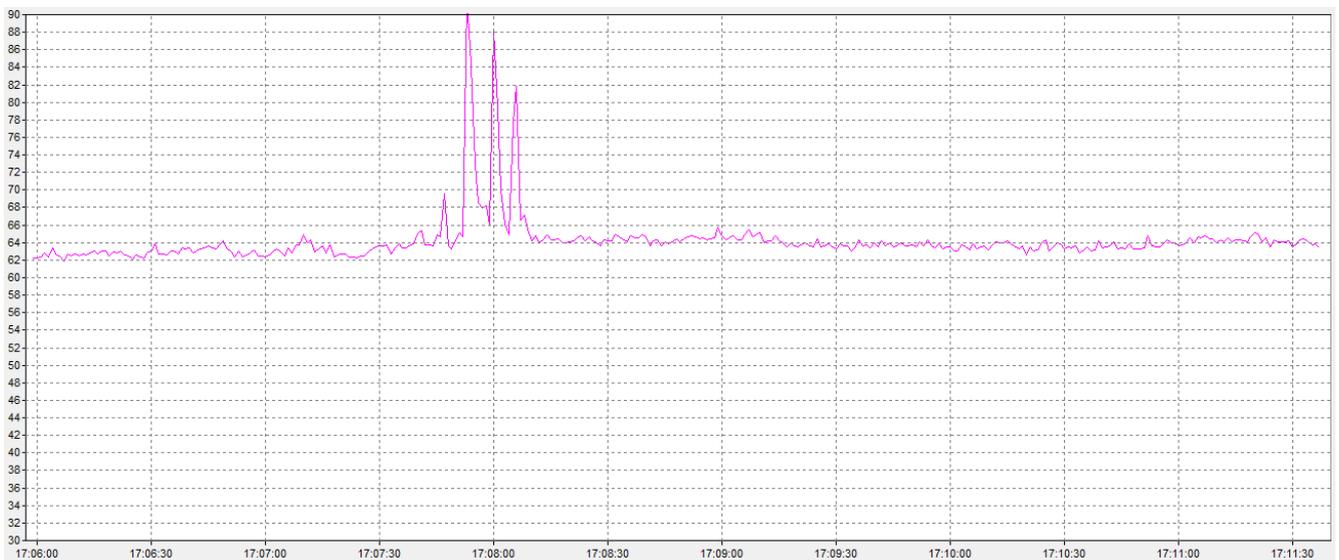


Figure 9: Measurement location 3. Equivalent sound level [dB(A)] as a function of time.

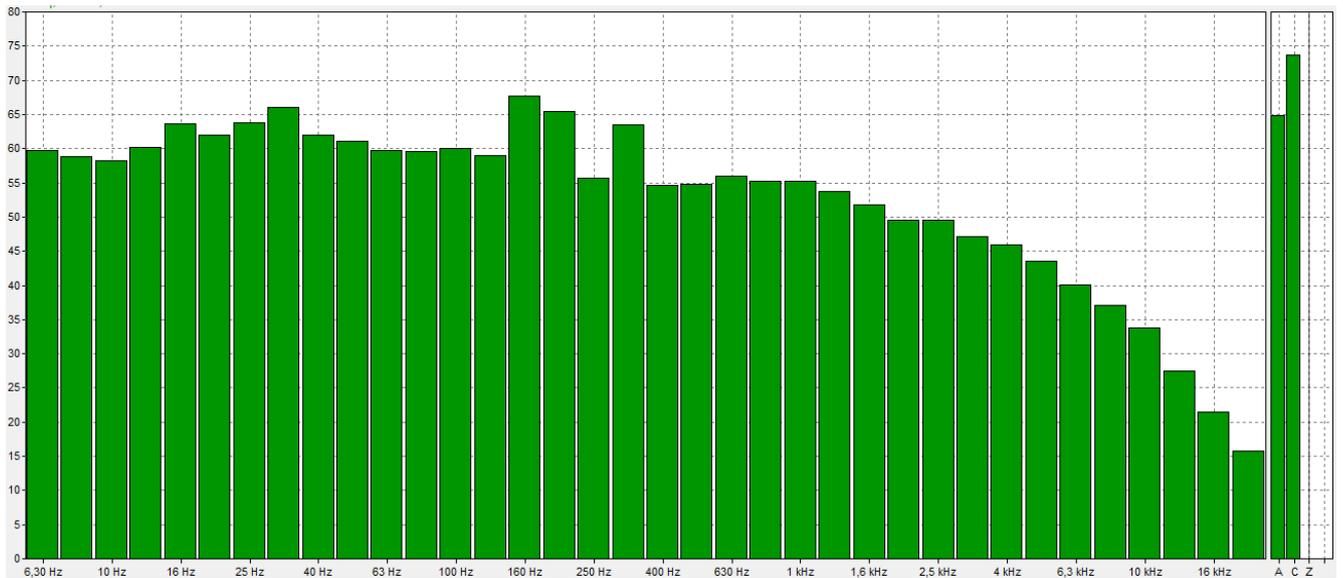


Figure 10: Measurement location 3. Equivalent sound level [dB(A)] as a function of frequency.

The effect of the wind was negligible. The noise source is quite steady. Low to mid frequencies are dominant in the measured noise level in this location, as can be seen in figure 10.

Location 4

The fourth location was downwind from the Becromal factory. The dominating noise source was the Becromal factory.



Figure 11: Microphone positioned in location 3.

The measured equivalent sound level on location 4 can be seen in figure 12 as a function of time and in figure 13 as a function of frequency.

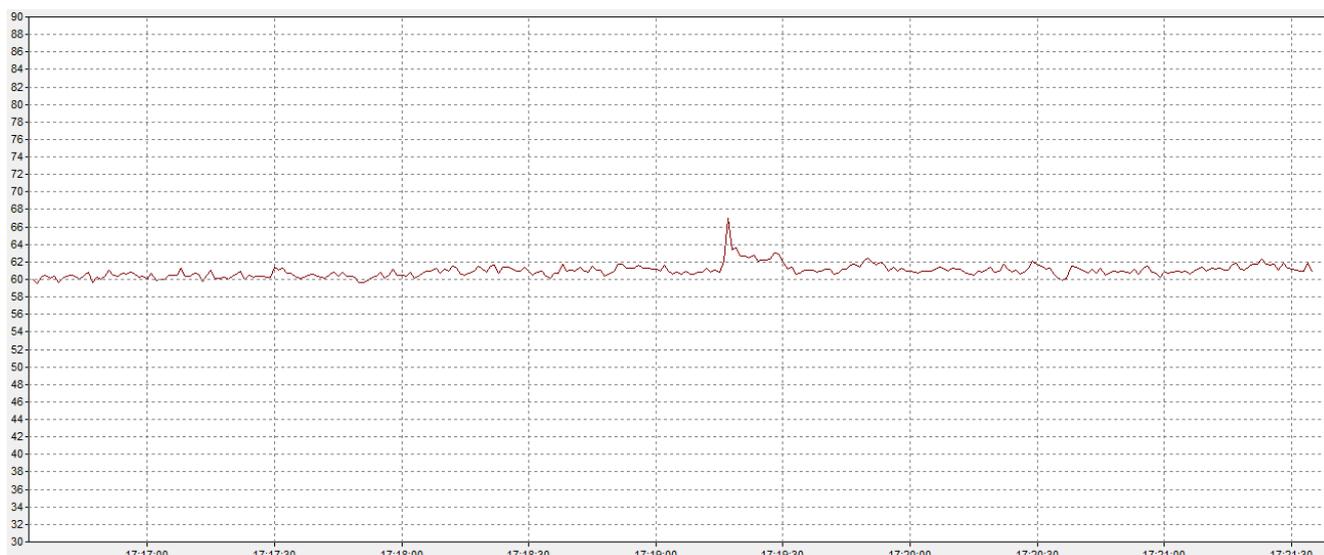


Figure 12: Measurement location 4. Equivalent sound level [dB(A)] as a function of time.

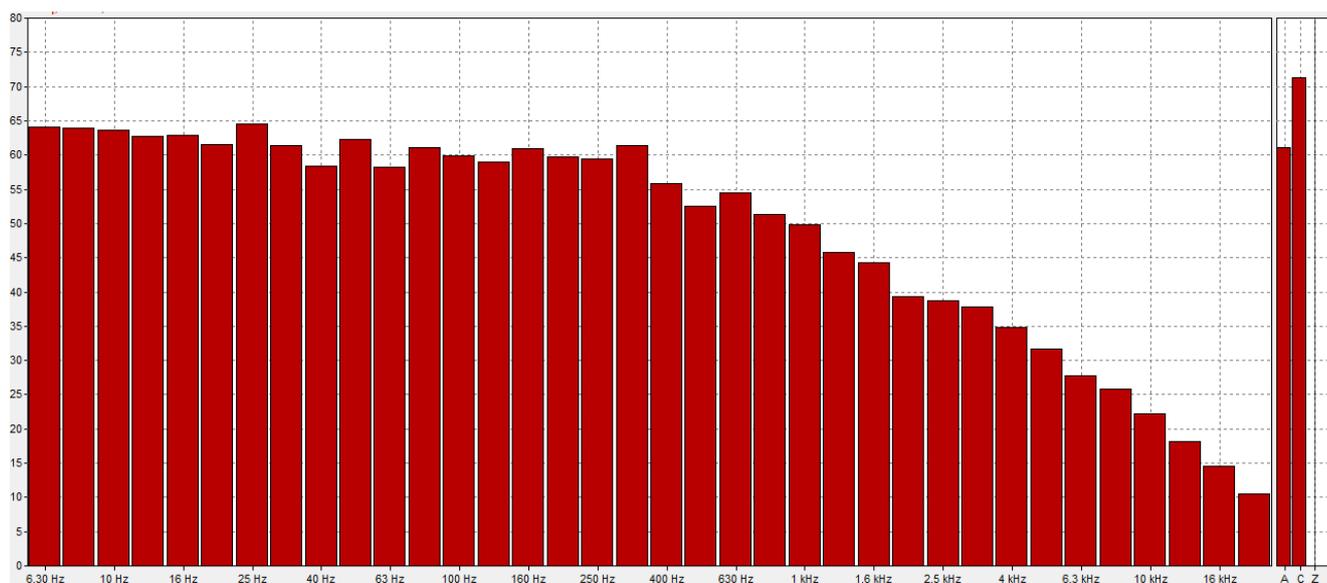


Figure 13: Measurement location 4. Equivalent sound level [dB(A)] as a function of frequency.

Low frequencies are dominant in the measured noise level in this location, as can be seen in figure 13.

Overview of measurement results

In table 2, the results for each measurement location can be seen.

Table 2: Equivalent sound level and maximum sound level of the measurements.

Location	Time [min]	Equivalent sound level	Maximum sound level
		L_{eq} [dB(A)]	L_{max} [dB(A)]
Location 1, south-west corner of the Becromal factory site	05:00	50	62
Location 2, south-west end of the Becromal factory	05:00	57	61
Location 3, north-west side of the Becromal factory	05:40	65	87
Location 4, north end of the Becromal factory	05:00	61	68

The noise level is quite steady in all locations, as can be seen on figures 3, 6, 9 and 12. It can be assumed that noise from wind had very little effect on the measurement results. The equivalent sound level was measured below $L_{eq} = 70$ dB(A) in all locations. The noise level of $L_{eq} = 50$ dB(A) on the south-west corner of the production site indicates that the noise level in the residential area will also be below regulation limits.

Comparison to noise measurements from last two years, shows a variation of noise level around $\pm 0-3$ dB, which can be explained by variations in weather conditions, snow cover, and in location 3, forklift activity.

Summary

The noise level was measured below $L_{eq} = 70$ dB(A) on the Becromal factory site. Because of the surrounding topography and the distance between the factory and the nearest residential area it is reasonable to assume that the noise level in the residential area will not exceed $L_{eq} = 40$ dB(A) during the night as a result of the noise from the factory operations.