Current Status and Problems in Mastering of Sound Volume in TV News and Commercials

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Abstract

Sound sources used for broadcasting on the air are usually produced and delivered in different levels of sound volume, thus inevitably creating the loudness/imbalance problem among various sound sources. This study examines the loudness of TV news anchorwomen's voice and the sound of commercial advertisements on the Internet using Absolute Sound Level, to evaluate the current status and identify problems in the sound-mastering process. The results showed that the three most famous broadcasting companies in Korea had different sound levels while delivering their programs on the air. The use of sound compressor/limiter by producers of commercial advertisements on the Internet can be easily found where the sound level of a common dialogue reaches to the maximum level, such as the climax of heavy-metal music, in order to get the audience's attention. On the Internet, this loudness/imbalance problem gets more serious since we have two different sound sources on the same web page, one for a loud advertisement and the other for a relatively quiet personal video/audio clip.

Keywords: *Absolute Sound Level, Loudness, Imbalance, Voice of News Anchorwomen, Commercial Advertisements on the Internet.*

1. Introduction

When CD (compact disc), an innovative storing technique for sound, was first introduced, the primary job of sound-mastering engineers was to adjust the gaps between tracks (i.e. songs) and their amplitude levels, sound volume in other words. However, people came to realize that the sound-mastering process could do much more, including changing the quality of sound. Since then, sound technicians have tried various ways to produce the best sound quality during the sound-mastering process. Regarding 'changing the quality of sound,' sound pressure is considered one of important factors. When a song is played on a radio and its sound level is lower than the sound from neighboring environments, it can be buried and may be inaudible. Therefore, people want to raise the sound pressure as much as possible to deliver their messages more effectively. Due to the requests from clients for producing commercials, the so-called 'sound pressure competition' began. Sometimes, people request to increase sound pressure even sacrificing the musicality of songs [1]. We can find the worst case in TV commercials, where clients usually want to have higher loudness than other competing commercials. Mastering engineers tend to apply the sound compressor and limiter to an abnormal level and often go further to distort/amplify the sound to 3,000~4,000Hz frequency range, which is the most sensitive frequency range to human ears.

Figure 1 is one of the popular recommendations for sound-mastering by the Dolby Institute, in order to correct the problem of different loudness in each music genre which may be caused during the sound production stage. Other recommendations include ITU-R and BS.1770-2 [2-3]. Designated amplitudes shown in Figure 1 can be used as a proper reference during production. But, unifying the amplitude of all sound sources into one specific number

may be considered inappropriate and unrealistic. Moreover, some music genres do not utilize the 0dBFS range at all, and hence cause a different issue of sound quality perspective.

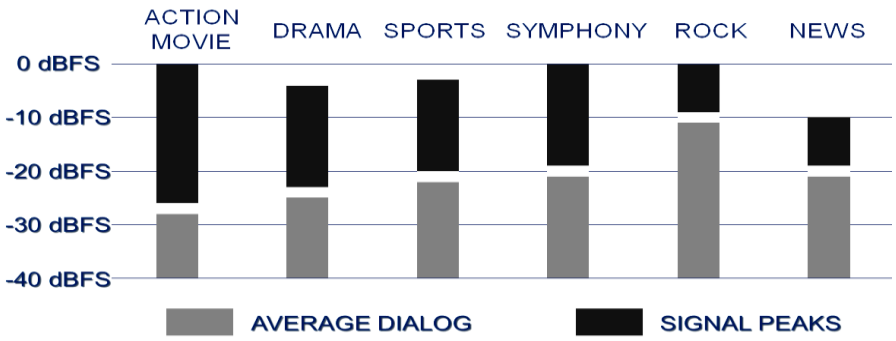


Figure 1. Mastering dBFS recommendation standard suggested by the Dolby Institute

It is true that in public TV and radio stations, sound engineers try to avoid drastic loudness differences between sound sources using a limiter for the listeners' sake. However, we are fully exposed to the imbalance/loudness problem while using audio contents on the Internet. People often have to adjust the volume very quickly when they open a new webpage, due to the discrepancy between extremely loud commercials and too quiet personal video clips. Sometimes, they need to adjust the volume one more time to go back to the original sound sources they are working on.

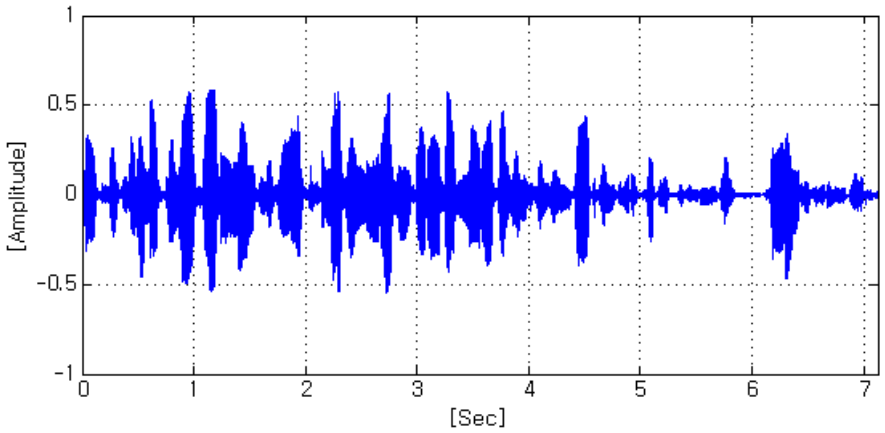
This study examines the loudness of TV news anchorwomen's voice and the sound of commercial advertisements on the Internet using ASL (Absolute Sound Level) [4], to evaluate the current status and identify problems in the sound-mastering process.

2. The Case of Human Voice as a Sound Source

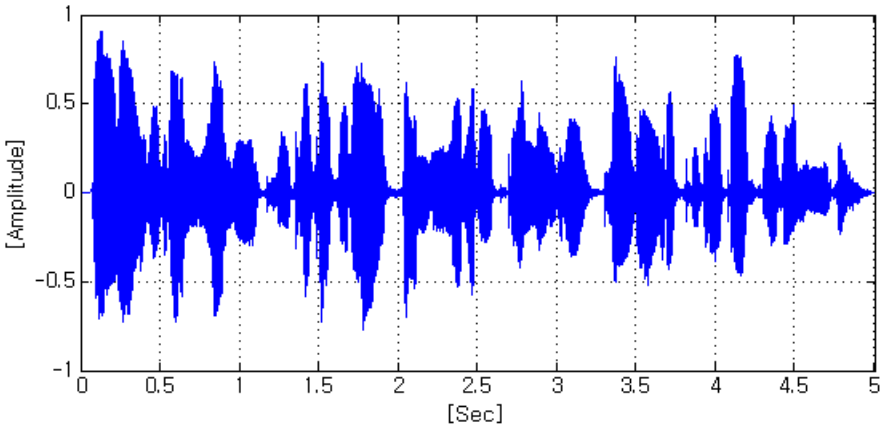
The ultimate goal of producing human voice is to deliver messages through sound. TV News is supposed to deliver important news happening around us, so it should satisfy the fundamental objective of human voice most effectively by delivering the information well [5]. In this study, we will compare the sound levels of the main TV news programs of the 3 Korean broadcasting companies ("KBS News 9", "MBC News Desk", and "SBS 8 NEWS") by applying ASL to measure the sound level of anchorwoman's first sentence.

It was found that the amplitude of the sound broadcasted by KBS was substantially smaller than that of MBC and SBS (Figure 2), where amplitude influences perceived loudness. Distribution of peak wave forms indicated that the three broadcasting companies did not aim for any specific amplitude. It is because they rarely, if not ever, utilize any dynamics effector including compressors and limiters. In other words, they attempt to deliver the actual voice of anchorwoman with respect to the energy.

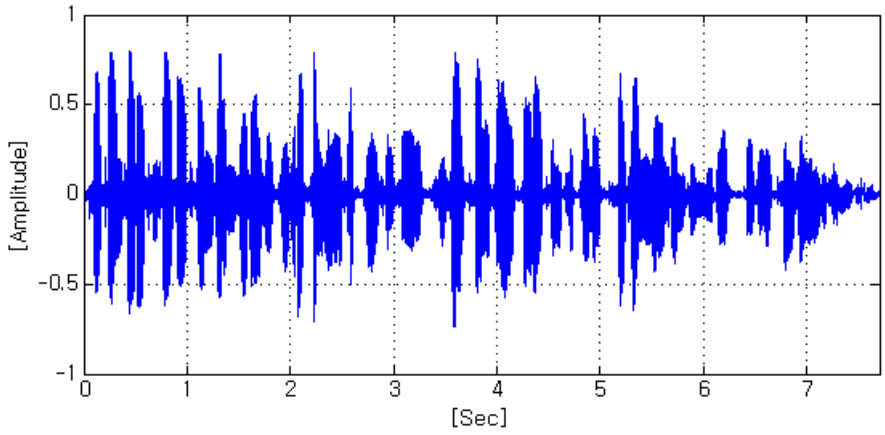
Figure 3 illustrates the energy distribution charts of Figure 2; the energy distribution of KBS is somewhat more scattered than those of MBC and SBS. The main reason is that the output sound level of KBS broadcasting was inconsistent, hardly maintaining steady energy. It was measured with relatively smaller perceived loudness. Pitch bandwidth was also relatively narrower, so it may result in a poorer appeal to the audience.



(a) KBS

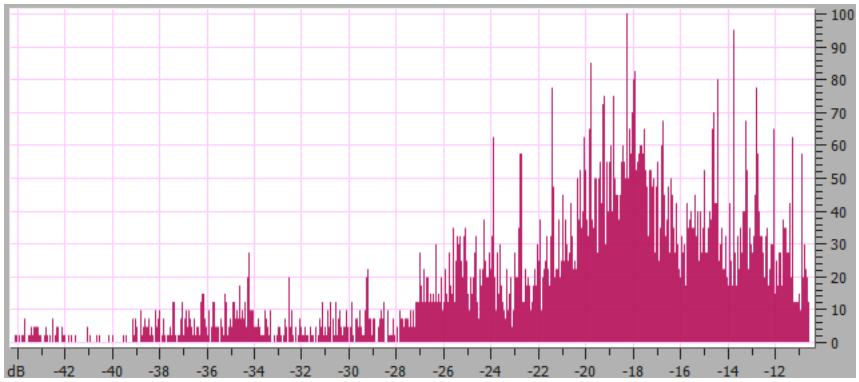


(b) MBC

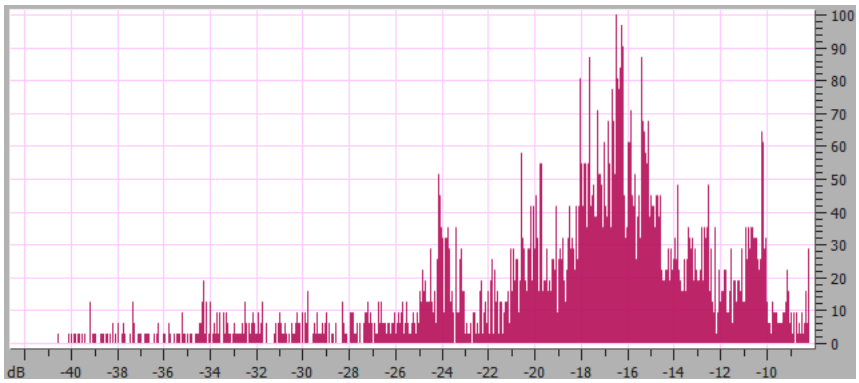


(c) SBS

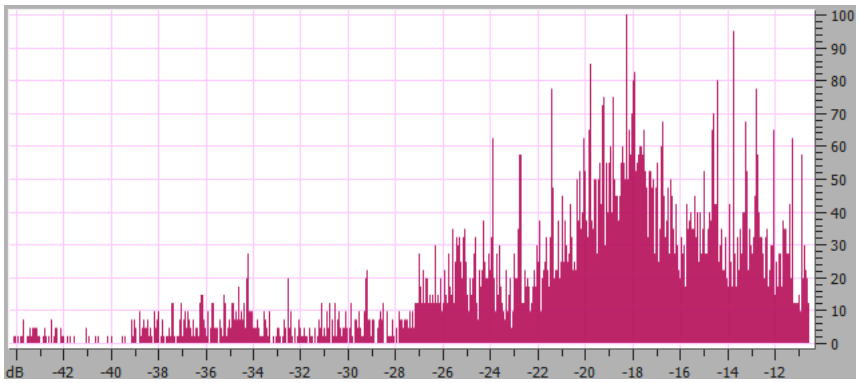
Figure 2. The wave forms of three news anchorwomen's first sentence



(a) KBS



(b) MBC



(c) SBS

Figure 3. Energy distribution charts of three news anchorwomen's first sentence

Table 1 below summarizes the comparisons among major parameters of energy distribution chart and wave form area measured by ASL. The average of total ASL was 51.7dB(S: Sound), 4dB smaller than currently available commercial music sound sources. This should be considered an appropriate loudness difference because the voice aiming to deliver important information should be quieter than the sound for enjoyment. It proved that the current broadcasting news programs follow the common rule.

However, significant difference was found in ASL among the 3 major broadcasting companies' main news. Firstly, ASL of KBS was 50.9dB(S), which was 1.8dB lower than that of MBC. Between MBC and SBS, there was 1.1dB difference. Any gap exceeding 0.5dB can be accounted because 0.5dB is the maximum perception error allowance. Hence, both 1.1dB and 1.8dB difference in loudness can be all substantially significant, which are easily and immediately recognizable by normal human ears.

The results showed that the 3 Korean broadcasting companies had substantial differences in loudness of their main news programs, due to each having its own criteria. We also assume that the difference would be larger in news programs on cable TV channels and Internet broadcastings.

Table 1. Amplitude statistics by ASL on TV news programs

Amplitude Statistics	KBS	MBC	SBS	Average
Maximum Amplitude [dBFS]	-4.66	-0.86	-1.99	-2.50
RMS Amplitude [dBFS]	-19.91	-15.40	-16.95	-17.4
Dynamic Range [dB]	37.10	30.30	32.25	33.2
dB(S)	50.9	52.7	51.6	51.7
dB(S) Deviation [dB]	-0.8	0.9	-0.1	0.6

3. The Case of Commercial Advertisements as a Sound Source

The sound of commercial advertisements presents the case of the loudness imbalance problem. As we have seen in the previous section, public news broadcasting narrowly overcomes the loudness problem because audio engineers usually adjust loudness prior to broadcasting or the basic setting of compressor/limiter prevents excessive sound pressure for public news broadcasting. However, it is clear that it is still a factor in making the audience uncomfortable.

Internet users have much more serious problems since they are directly exposed to the audio contents without passing any protective or screening stage. The energy characteristics of commercial advertisements show radical differences between sources depending on the objectives of each commercial, so it may be more effective to analyze several specific cases than trying to extract average values for all commercials.

Table 2 is the result of measuring 10 sound sources of commercial advertisements on the Internet using ASL. When compared to the sound levels of 30 main audio contents randomly selected on the Internet that users actually use, the average sound volume of advertisements is 55.1dB(S), much higher than main contents which spread over the wide range of 45-57dB(S). This average volume is also much higher than that of TV news anchorwomen's voices, 51.7dB(S). Only the sound level of loud music at climax can compete with this [4].

Table 2. ASL of advertisements and actual contents in dB(S)

Sound Source	dB(S)	Deviation [dB]
Cass	57.2	2.1
Gang Jung is excellent	54.4	-0.7
Naver App	55.1	0.0
iPad2	55.8	0.7
Love Bit	56.5	1.4
Chanteclair	54.4	-0.7
Coupang	55.1	0.0
Xylitol	53.7	-1.4
Bausch Lomb circle lens	54.8	-0.4
Galaxy S2 Eskimo	54.4	-0.7

[Average: 55.1dB(S), Maximum: 57.2dB(S), Standard Deviation: 1.1dB]

It should be unnatural for the audience to hear the human voice of the advertisement in which its ASL is similar to that of loud music. While conducting the study, we have found some advertisements where ASL of human voice was similar to that of a powerful metal music at its climax. Applying compressor/limiter up to the excessive level must have been inevitable in those advertisements in order to amplify the sound level of human voice to the loudness level equal to the climax of metal music.

A bigger problem lies in that ASL of the original content of each page on the Internet was measured generally lower in ASL and the deviation was turned out to be too big. Contents on the Internet are supposed to have extremely deviated loudness depending on their wave form process. Majority of contents on the Internet are produced by individuals and therefore recorded through common recorders producing the natural wave forms in low ASL. On the other hand, all advertisements and commercial sound sources go through substantial amount of compressor/limiter application which produces artificially processed wave forms. Consequently, it is inevitable that there is a large difference in absolute loudness between the two sound sources.

Let us assume that an audience may enjoy an audio content with ASL of 45dB(S) at increased loudness. Then, he/she will be surprised by the excessive sound pressure of following advertisement in ASL of 55dB(S), and he/she quickly and manually turns the volume down to hear the advertisement at comfortable level. Afterward, he/she often has to manually turn the volume up again in order to enjoy another audio content of the same web page with ASL of 47dB(S). We may classify the audience into two types: the one who changes the volume frequently to protect their hearing or maximize the listening pleasure, although it is not convenient, and the other who listens to audio contents ignoring optimal loudness and abusing their audible sense.

Figure 4 illustrates the wave forms of advertisements on Naver App, one of the most popular portal pages on the Internet in Korea. Energy envelopes formed at the voice sections proved that compressor/limiter must have been applied at maximum level intending to raise amplitude. These waveforms are clearly distinguishable from those of anchorwomen's voice previously shown in Figure 3. Moreover, the energy distribution chart in Figure 5 shows that energy is extremely centered around the -10dBFS area, while energy of anchorwomen's voice is distributed widely.

Table 3 presents the overall statistics for amplitude and ASL. Notice that ASL is over 55dB(S) although it is a general dialogue section. This loudness level is close to the climax of recently produced music sound source and it is even higher than the maximum ASL of metal music sound source, which was produced before 2000.

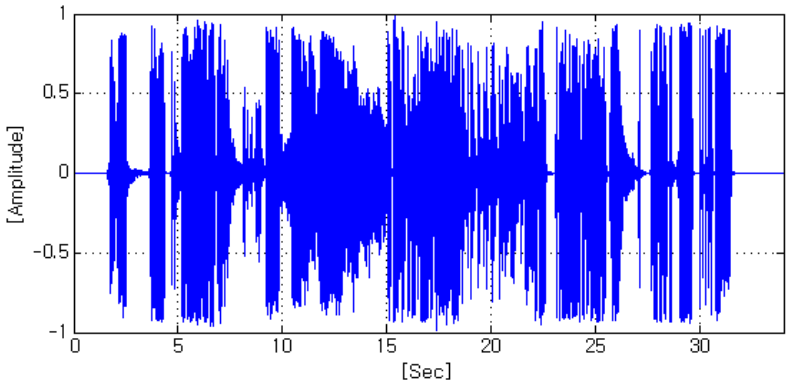


Figure 4. Sectional wave forms of 3 sentences in the Naver App advertisement

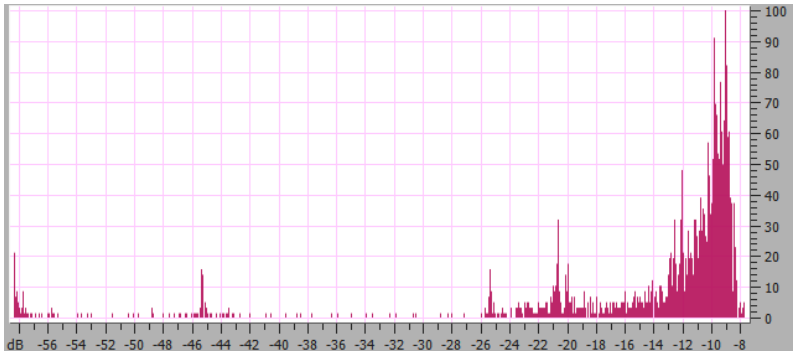


Figure 5. Sectional energy distribution chart of 3 sentences in the Naver App advertisement

Table 3. Sectional dB(S) of 3 voice sentences in the Naver App advertisement

Amplitude Statistics	Naver App advertisement
Maximum Amplitude [dBFS]	-0.33
RMS [dBFS]	-12.62
Dynamic Range [dB]	42.5
dB(S)	55.1

4. Conclusion

This study has identified the loudness/imbalance problem of some sound sources using the ASL index system. The loudness/imbalance problem can be commonly observed in public broadcasting news, commercial advertisements, and even music source although music was not exclusively dealt with in this study.

It is hard to apply the current mastering recommendations including the one suggested by the Dolby Institute, ITU-R BS.1770-2, and others, to all sound sources. As we proved in the case of commercial advertisements on the Internet, the sound is directly delivered to the audience without undergoing any adjusting process, unlike the sound of public broadcasting mastered by audio engineers prior to its actual transmission. This loudness/imbalance problem is expected to persist for a while because the clients, that is, advertisers, will continue to ask producers to have higher loudness than other competing advertisements. In order to solve this problem, the standard volume controlling system utilizing ASL should be developed and implemented in the near future.

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