

## SHOULD STUDIO RECORDING EQUIPMENT COMPENSATE FOR THEATER REPRODUCING CHARACTERISTICS?

*At a meeting of the New York Section of the Society, held at New York on December 13th, an open forum discussion of the subject of compensation was held. The discussion follows:*

**MR. TASKER:** We have heard a number of examples this evening of sound that was produced through recording and reproducing systems that were engineered to cooperate in some manner or other. The meeting is now open for remarks on the manner of engineering the two systems with respect to each other.

**MR. EVANS:** Quite a long time ago, two or three years at least, it was suggested that the recording system be made to compensate for the theater characteristics. I advocated rather strongly to the Sound Committee that that be done, but the majority of the Committee seemed to feel otherwise. My reason for advocating it at that time was that the reproducing equipment of those days was rather deficient in both high and low frequencies, and it seemed as though some of the deficiency might be compensated for in the recording system. The majority of the Committee felt, however, that nothing of that sort should be advocated because it would not be long before the reproducing equipment would be improved, and then anything that had been so recorded as to sound well on existing equipment would not sound so well on the improved equipment. The discussion continued for a couple of years, but the recommendation was finally made that the recording system should be so designed as to produce a flat characteristic on the print, and that the reproducing equipment provide a flat characteristic from the print through the loud speaker. I do not know whether the Standards Committee has acted in the matter.

**MR. BATSEL:** It has not been presented to the Standards Committee.

**MR. EVANS:** It has, however, been formally adopted by the Sound Committee. At about the time it was adopted the new reproducing equipment was becoming available. RCA was bringing out the high-fidelity system and Western Electric its wide-range reproducing equipment. Strangely enough, at about the same time some of the studios on the West Coast acquired the idea of compensating for the reproducing equipment during the recording; and in the spring we began to notice that some of the pictures coming from the Coast had been so compensated, with the result that we are now faced with a rather difficult situation. According to recent figures, about 1000 theaters are now equipped with high-fidelity or wide-range systems—mostly class A houses, I believe—and it is very confusing at the present time to have some of the pictures compensated during recording for the older equipment: when these are played on the newer equipment they do not sound as well as when reproduced on the older type of equipment. In July Dr. Goldsmith asked the Sound Committee to consider the subject of standardizing the frequency characteristic and to try to induce the

various studios to adhere to such a standard, so that the recordings made by all the studios would sound alike on the same equipment. This problem will be one of the most important before the new Committee this coming year, and I hope some progress will be made in solving it.

MR. KELLOGG: Did the compensation take the form of accentuating the bass or accentuating the high frequencies?

MR. EVANS: More particularly the high frequencies.

MR. MCNAIR: It seems to me that the recommendation of the Sound Committee that the recording of itself be flat, and the theater equipment also of itself be flat, is a sound point of view. It might be well to ask, though, whether any one knows the reasons why certain producers were led to make films that were not in accordance with that principle. (No answer.)

MR. TASKER: It is true that compensation that raises the high frequencies above the normal level during recording, and decompensates to the same extent in reproducing, provides inherently a lower noise level than can be attained with the so-called ideally flat characteristics?

MR. EVANS: I believe that that statement is true only for a limited amount of upward compensation of high frequencies during recording, with appropriate downward compensation, or decompensation, during reproduction. If we plot the curve of acoustic energy produced by the ideally flat reproducer through unmodulated film we should expect a noise-energy curve that would continuously rise toward the higher frequencies. If this curve were then multiplied by the relative sensitivity of the ear for each frequency a new curve would result that would be a figure of merit for this system. If, then, the recording system is compensated upward to correspond to this latter curve, and the reproducing system decompensated downward to an equal extent, we should attain the lowest noise level that is possible.

MR. YAGER: By increasing the high-frequency response in order to allow for the loss in compensation, the noise level of the entire system increases with the gain of the recording amplifier; and nothing is gained unless the noise level is entirely within the range of compensation.

MR. EVANS: We must bear in mind when considering noise level, that the film is probably at the present time the controlling element. I do not believe that the system noise is as great as the film noise after the film has been run through the projector a few times. The noise level increases considerably after a few trips through the projector.

MR. BATSSEL: Our experience indicates that the point Mr. Evans and Mr. Yager have made is essentially correct. If it is necessary to compensate or equalize for losses in reproducers, the recording system would probably have to be peaked so much for frequencies as high as 9000 cycles that the swing for full modulation would be taken up by those frequencies instead of frequencies in the range contributing most to the loudness of the speech or music. The gain required for reproduction would be increased to such an extent as to result in perhaps more noise than is produced by a flat system. In reproducing, there is a certain amount of extremely high-frequency hiss that would be lost by attenuating the high frequencies, but much can be accomplished in limiting noise by having a reproducing system free of peaks. The noise is much less, as pronounced peaks at some frequencies may increase the noise without having much effect on apparent

loudness. If the system is smooth, some of the hiss due to the film grain is eliminated by attenuating the highs. By carrying compensation to extremes the noise will be increased.

MR. RICKER: In the average theater, or even in class *A* theaters, to what extent can a loud speaker reproduce film grain noise?

MR. TASKER: Do you mean with respect to the frequency?

MR. RICKER: The point I wish to make is this: that the loud speakers are not able to reproduce frequencies such as would be represented by the film grains that I find and measure under the microscope. I believe that many of you engineers charge ground noise against film grain when it should be charged to some other factor.

MR. TASKER: I believe it is a fact that noise from film does extend over the whole frequency range; but it is obvious that any 500-cycle components, for example, could scarcely arise from film grain or even grain clumps, but must be due to irregularities of the base or variations of the sensitivity of the emulsion, or something of that sort.

MR. RICKER: A careful examination of film after it has been used a few times and dried out would show reason enough for ground noise. There will be found scratches and translucencies that come into the base as well as in the emulsion; enough to be responsible for the increased noise. If the base is examined by reflected light under a microscope, or by transmitted light, it will be found that the most perfect base is anything but constant in its refractive effect. In other words, the piece of film base, when magnified, looks like a piece of corrugated glass instead of a piece of flat glass. Nitrate base is more perfect than acetate base; but either, when stripped of emulsion, will provide plenty of ground noise if run through a sound head.

[Note: Measurements of the ground noise of film base are given in the article by O. Sandvik, V. C. Hall, and W. K. Grimwood, on p. 83 of the February, 1934, issue of the JOURNAL—*Ed.*]