

will be reached in each case through a description of the needs for each tolerance and of the difficulties that will be encountered when tolerances are exceeded. Perhaps each standard will become a short treatise on its particular subject, but if it is a short one, and a clear one, it will contribute to the improvement of motion-picture production. In those cases in which the manufacturing tolerances are close to the quality tolerances the newer techniques of the quality control people can be used. Means and standard deviations can be specified.

I do not believe it is possible to standardize on methods of standardiza-

tion, as for example, when to use symmetrical tolerances and when not to use them. However, I do believe that there is a golden rule which says: "Write standards and tolerances for other people to use as you would like other people to write them for you."

Discussion

Deane R. White (E. I. du Pont de Nemours & Co.): There is a point that you did not mention with regard to one of your unsymmetrical vs. symmetrical tolerances that has come up and caused trouble at the international level. You had, in millimeters, 35.00 plus 0 minus 05. In the other case of the symmetrical tolerances you had 34.98 plus or minus 03. In this problem

not only do we have this question that Dr. Carver has been speaking of — the "clear understanding," but when we come to express the tolerances, both in inches and in the metric system, we get into additional troubles in expressing tolerances. In the international standards currently under discussion that is one of the greatest problems that we face. When you express the tolerances in the two systems, you may not be specifying the same thing unless you are very careful. You may have to go to a tolerance specification with more significant figures than is desired by workers in either the English or the metric system.

James A. Moses (Session Vice-Chairman): I'm sure all of us who have worked in the various committees recognize the importance of the precautions and statements that Dr. Carver has made and I know of no other person who could give us better guide rules to help us determine how to make these tolerances.

Test Films — Standards at Work

By BOYCE NEMEC

Uniqueness of content sets one motion picture apart from any other. Yet to reach its audience at all, that same motion picture must be precisely standardized, a rigorous condition not imposed upon any other creative product. One of SMPTE's jobs is to determine "how standard." How this is done through test films is explained in this paper.

PUBLISHED transactions of one of the earliest meetings of the Society report on what seems in retrospect a very primitive problem in standardization — or more properly, the lack of it.

Camera work for a Department of Agriculture film had been assigned to two crews who were to work simultaneously in different parts of the United States, with films to be sent to Washington where the picture was to be edited. We must assume that each crew did its work properly and that footage sent in was acceptable because both were kept on the job until their individual assignments had been accomplished. All went well until the editor began roughing out the finished picture. The record is not clear, but either he or a projectionist learned about standards of interchangeability the hard way, for it was discovered that one of the cameras had placed the frameline on the centerline of a lateral pair of sprocket holes while the other had placed the frameline halfway between. The film could not be intercut.

Certain standards of interchangeability needed at that time did not exist. It was such needs as this that helped move a group of experimenters and

practitioners in the then nearly 30-year-old "industry" to organize this Society in 1916 and to hold it together during its early shaky years.

Standardization was and is one of the Society's principal official functions. It moved ahead solidly if slowly. By 1922, film dimensions, and image size and location had been formally tied down. In the mid-twenties, the coming of sound introduced a new order of precision and imposed some new and rigorous standardization and interchangeability problems on engineers.

About the same time the American Standards Association entered the picture, bringing the benefits of national standardization experience plus the national and international values that attach to ASA accreditation.

The motion-picture industry was growing both at home and abroad. It had demonstrated a need and a desire for engineering standards, particularly those involving interchangeability, to insure the ready exchange of motion-picture films.

To meet this need the members of the Society of Motion Picture Engineers and later the active participants in the work of the Motion Picture Research Council contributed the practical experience and professional knowledge essential to technical accuracy and editorial competence in the drafting of standards content. The Society's Board of Governors and the committees on procedure of

the American Standards Association became formal safeguard agencies insuring that all interested individuals were given equal opportunity to express their views on any standards proposal; the *Transactions* and *Journal* of the Society became the recognized medium for making standardization efforts and accomplishments known to a specialized worldwide audience.

Thus the essential elements in the process of standardization came into existence. A review of the history of some of the basic standards in use today will show that these elements functioned effectively.

A standard has been defined by Ralstone R. Irvine, an authority on the legal aspects of standardization, as "... simply a definition of a product or procedure in terms of certain features." And he continues: "Standardization, accordingly, is simply the process of reaching agreement on the form and content of such a definition."

Within these boundaries there is a continuing need for precision and uniformity in all dimensional references and tolerances. A need exists also for care and precision in the development of the supporting language.

Thus, we have defined a standard and have stated that (1) it must be technically accurate; (2) it must be as understandable as words will allow; (3) it must be the product of joint effort; (4) it must represent the views of all interested parties; and (5) channels must be available for making its presence known.

Test films, apparently, are standards which meet all of these conditions and have two additional virtues worth noting: they are self-contained test devices that, in effect, apply themselves and so are little subject to errors of

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individual interpretation; and they perform their measurement functions at the point of end use.

In a class by themselves, they are truly standards that work. They are standard gauges. So the standards program is a fundamental gauging program.

There are 16mm and 35mm test films; picture-test and sound-test films; films that carry conventional picture and conventional sound and depend for reliable application upon the use of a good eye and a good ear; sound films for completely quantitative testing whose capacity to generate a signal means nothing to the ear but requires an appropriate piece of conventional test equipment for evaluation. There are sound test films, all copies of which are original recordings direct from a calibrated signal source and others that are printed from a negative. Some films are intended for use by equipment designers and development engineers while others are regular day-to-day test tools used in routine maintenance operations in studios, schools, repair shops and in theaters and television stations.

Each of the 39 films and test slides now available from the Society was designed to serve a particular purpose.

A series of 16mm technical test films covered by American Standards was the product of special attention given during World War II to the Army's need for 16mm sound projectors of higher initial quality and of more reliable long-term performance than had been available from commercial sources. These films are now the standards of the industry, used by the military in acceptance testing of new and repaired equipment, used routinely in television stations as maintenance tools and used by projector manufacturers for quality control and demonstration.

In the area of 16mm visual tests is a new and remarkable black-and-white film described recently in the *Journal*. This film is finding wide use in the aligning and testing of 16mm optical printers as well as in testing for travel ghost and for quantitative determination

of projector steadiness, effective aperture size and dynamic resolution of the overall projection system.

Magnetic recording has now become widely adopted not only for original recording in the studio and for 16mm and 35mm re-recording, but also for some 16mm, 35mm and wide-film release. Initially there was no absolute signal level standard and it was necessary for each magnetic system user to establish his own. Then when a Navy research project produced an original recording of known recorded signal level, the first in a series, the Society acquired one of the absolute standards and is now offering to all who are interested, secondary standards calibrated against this one.

The Society publishes a *Test Film Catalog* which contains titles and standard number as well as some quantitative information and the complete story on the standards with which they comply.

The work that has gone into the test film programs of the Motion Picture Research Council and of the Society has not even begun to be measured, but it is certain that in total it would be an impressive figure.

The two organizations that have conducted these programs have organized their work effectively and have seen it through in every instance to a clean-cut and useful conclusion. This is a good record. But it is a continuing job, one that needs close attention.

It would seem that the Society needs not only prompt attention to new test film problems as they arise, but also a new program aimed at encouraging the more effective use of the test films now available. These are working standards that should be within arm's reach of every projection room work bench, every repair shop test stand and every 16mm and 35mm television projector.

Every entertainment film, every educational film and every television program film was made with a purpose in mind but that purpose will not be realized unless the projection and sound equipment used are up to standard in their performance.

Discussion

Glenn Dimmick (Session Chairman): What is the trend in the use of test films. What has been happening in the last few years?

Mr. Nemes: Up until a year ago, at least, the total distribution of test films was pretty consistent; but, the fact that it was consistent turned out to be a danger sign. Volume remained almost uniform through the period of the introduction of CinemaScope and the installation of a good many CinemaScope equipments in theaters. The Society distributed CinemaScope test films in substantial volume but the quantity of other films fell off. I'm sure that this was not the direct result of decreasing need for other test films but was perhaps a result of the Society's devoting an excessive amount of attention to some of the problems that CinemaScope brought, combined with a decreasing amount of attention to some of the 16mm users and their film problems.

William E. Youngs (U.S. Information Agency): What is the Society doing to encourage the use of a standard release print? I've been a member of Local 224 for quite some time and it's been a long time since I've seen a standard print. We see brand new prints coming out with the leaders all mixed up. You can't even rely on the accuracy of the footage numbers. You see extended leaders; the 9-foot start mark may be 12 feet from the beginning of the film. Although that is an exception, it is indicative. You actually have to measure each one in order to get your correct starting point.

Mr. Nemes: That is one of the problems inherent in standardization. Within SMPTE and ASA the machinery exists for preparing standards. The people who work on standards are competent engineers. They are interested, and so make themselves available to do the technical work involved; their standards are publicizable and they are pretty well publicized; but it's basic that there is not, and should not be, any machinery in ASA or in the Society for policing the use of those standards, because they're completely voluntary.

Certain trade associations are in a slightly different position and, in order to improve the lot of their consumer customers and of their members, they sometimes adopt a bit of a promotion campaign with the general public. They cannot force the use of standards; but they're in a fairly strong position because they're more concerned with the dollar and cents aspects of standardization, where we try to stay just one arm's length away from that aspect of it.

Other than publication there isn't much the Society can do. The Research Council is doing a great deal now in the way of missionary work with theaters. They have two engineers, I believe, who are calling on theaters, talking to projectionists, asking them what their problems are; they're coming back with perhaps the same kind of answers, or the same kind of questions, the same kinds of problems that you just expressed. Perhaps they will eventually solve your problems.