The Value and Use of Standards in the Microfilm Industry

No industry that creates, disseminates, and stores information can reach its potential until it establishes standards that will result in product and procedural uniformity

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There is a widespread misconception about standards that must be dispelled: *Standards are OK for some industries like automobile manufacturing, but they inhibit creativity in rapidly developing, technology-based industries.*

On the contrary, standards are a vital part of nearly every industry and should be taken seriously. Without standards, there would be a tendency for every manufacturer and service provider to create new and unique products and methods that would be incompatible with other similar and related products and services.

The phrase "reinventing the wheel" seems appropriate to convey the chaos that would ensue if there were no standards or if they were universally ignored. Suppose, for example, there were no standards in the automotive industry to define the parameters for "standard wheels." All wheel manufacturers would be free to create what they considered to be good wheels. They could choose the diameter and the rim width and depth for their wheels. They could select the materials to be used and the number of lug bolts used to secure the wheels to automobiles. In short, every time they decided to create a new kind of wheel, they would be free to do so. The result would be that seldom, if ever, would consumers find wheels from different manufacturers that would fit their cars. It would lead to misunderstanding between car owners and make it difficult for them to trade, exchange, or lend wheels.

At the Core

This article:

- Describes what standards are and what they are not
- Explores how standards are created and adopted
- Reviews microfilm-related standards

However, because wheel users and manufacturers have defined and created standards that define the parameters of a series of standard wheels, wheel users and owners have access to all the characteristics of designated standard wheels. Standard wheels produced by every wheel manufacturer have identical characteristics and wheel users can be certain that when they buy one of the various standard wheels they are receiving wheels that can be safely interchanged with other standard wheels with the same designation.

This example should convince the skeptical reader that standards do indeed serve a valuable and necessary purpose. Still, it is important to understand what standards are and what they are not as well as how they are created and adopted. This will make it easier to

determine whether or not it is advantageous to adhere to established standards in one's own work environment.

Why Standards?

In the United States, the American National Standards Institute (ANSI) administers and coordinates the U.S. voluntary standardization system. It recognizes by accreditation certain groups as being competent to create standards for their industries. ANSI has established specific procedures that must be followed by these groups in order for their new or revised standards to be approved as American National Standards.

ANSI standards are **voluntary standards** and neither the members of industries that have created and adopted them nor anyone else is *legally required* to adhere to them. However, it is common practice for government agencies and other buyers to require that the items or services they purchase conform to specified standards. It then becomes obvious that manufacturers and service providers who expect to sell their goods and services to the greatest possible number of prospects will *voluntarily* adhere to the specified standards.

For example, contractors who contemplate providing goods and services to the U.S. government, especially its military departments, must be prepared to conform to the various provisions set forth in applicable military specifications. These military standards frequently incorporate and require conformance with ANSI standards. Mil-M-9868 is a notable example. It describes the specific requirements for submitting microfilm documentation for components supplied to the Department of Defense. Even subcontractors supplying the smallest components for major assemblies must conform to this document.

Microfilm Industry Standards

Manufacturers and microfilm users have come together for decades to create and revise standards for their industry. The National Association of Photographic Manufacturers (NAPM) and the Association for Information and Image Management (AIIM International, which was originally named the National Microfilm Association), have standards-related groups within their organizations that are comprised of individuals representing both manufacturers and users of microfilm. These standards committees or groups meet to create and revise standards that relate to the microfilm industry.

As a result of the work of these and other groups, there are several accepted standards that relate to all facets of the microfilm industry, from the manufacture of the film and related filming and retrieval equipment, to the procedures to be followed when measuring the amount of chemicals allowed to remain in the processed film if the images are to be retained and the recorded information is to be retrieved for at least 500 years.

The creation and revision of standards is not without difficulties. When standards groups meet to consider establishing a new standard, it is natural for manufacturers to want the parameters associated with their existing products to be adopted as the standard parameters. End users want the equipment they have already purchased and the procedures they have already devel-

oped and implemented to serve as the equipment and procedures to be cited in the standard.

Members of standards committees engage in serious in-depth (sometimes heated) discussions about the merits and shortcomings of each detail of proposed standards and revisions to existing standards before these details ultimately find their way into a published or revised standard. Even when there is final agreement in these committees as to the exact wording to be used in the planned standard, the proposed document must then be publicly distributed to all interested parties for review and comment. During the period when the proposed standard is open to peer review, everyone with an interest in the proposed standard has the opportunity to submit comments and suggestions for possible inclusion in the final document.

Each comment is carefully considered by the standards review committee before it is either accepted, accepted with modification, or rejected. If there are many opposing views and suggestions, the proposed standard may undergo numerous industry reviews before it is finally accepted by the review committee and submitted to ANSI for adoption and publication. The microfilm industry has been fortunate to have a large number of standards adopted and disseminated by ANSI. These standards have made it possible for the industry to have equipment that is compatible and procedures that are universally used throughout the United States.

Making Standards Flexible: A Case in Point

Once the ANSI standards used in the microfilm industry are adopted, however, the industry is by no means locked forever into products and procedures that will inhibit progress. For example, ANSI/NAPM Standard IT9.17 describes three specific methods that may be used to precisely measure the amount of thiosulfate ion remaining in the emulsion of processed microfilm, which is important to ensure the long-term quality of the images.

The only acceptable form of processing that may be used for photographic film for images of information having permanent value involves subjecting the exposed film to a developing bath that converts sensitized silver halide crystals to metallic silver. This chemical developing process produces a durable film image that is visible to the human eye. Because the developing process converts only the silver halide crystals that have been exposed to light, it follows that the silver halide crystals that were not exposed to light remain in the film emulsion after development. These unexposed, undeveloped crystals must be removed from the emulsion or they may self-develop over time, thereby darkening and obscuring the silver images. By immersing the film in a "fixing" bath, unexposed, undeveloped silver halide crystals are removed from the film emulsion. Unfortunately, the thiosulfate component of the fixing bath can have a long-term adverse effect on the processed film and, therefore, must be thoroughly washed from the emulsion during the final wash cycle.

One of the standards groups within NAPM conducted extensive research and testing and verified that residual thiosulfate in processed film can have a deleterious effect on silver film images. Experimentation and accelerated aging tests have made it possible to establish the maximum amount of residual thiosulfate that can be allowed to remain in various types of photographic film without seriously degrading the image over specified periods of time.

For example, according to the latest version of ANSI/NAPM Standard IT9.1, polyester-based silver halide microfilm with a residual thiosulfate content of not more than 0.014 grams per square meter of film merits a **life expectancy** (LE) rating of 500, meaning the film images have a life expectancy of at least 500 years when stored under prescribed environmental conditions.

If organizations that use microfilm for the preservation of information with permanent value will require their in-house filming group and/or service bureau to use the correct (polyester-

based) film stock, to follow prescribed filming procedures, and to make tests that confirm that the amount of thiosulfate remaining in the processed film does not exceed the amount specified in the standard, then and only then can they be assured that their film-based images will be retrievable for at least 500 years.

This same standard also informs microfilm users that if they have used acetate-based microfilm for recording images, they should not expect the images to be retrievable for longer than 100 years because acetate-based film images have an LE rating of only 100.

Current Microfilm Standards

Inasmuch as the products and procedures used throughout the microfilm industry have been standardized, it is instructive to look at some of the standards that have been adopted and are in use. Note that while the identification of standards includes four digits to identify the year of adoption or revision, the accompanying list uses "xxxx" in place of the year of issue or latest revision. One should always request the most current version when purchasing any ANSI standard.

ANSI/NAPM IT9.1-xxxx *For Imaging Media (Film) – Silver Gelatin Type – Specifications for Stability* sets limits for the amount of thiosulfate allowed in the emulsion of various film products for different levels of image permanence.

ANSI/NAPM IT9.13-xxxx *For Imaging Media – Photographic Films, Papers, and Plates – Glossary of Terms Pertaining to Stability* clearly defines words and ideas used in the world of photography, including the microfilm industry; can be most instructive to periodically review this document in order to be certain of the definition of words used by professionals in the industry.

ANSI/NAPM IT9.11-xxxx *For Imaging Media – Processed Photographic Films – Storage* sets forth various environmental and other requirements for the containers and vaults used to safely store photographic film used for recording images that have various retention periods.

ANSI/NAPM IT9.15-xxxx *For Imaging Media (Photography) – The Effectiveness of Chemical Conversion of Silver Images Against Oxidation – Methods for Measuring* describes tests that may be used to determine the degree to which metallic silver in processed film products has been converted to silver sulfide when the images have been treated with a polysulfide solution. This conversion is especially useful in protecting silver film images from oxidation (redox) when exposed to an environment that is harmful to silver film images.

ANSI/NAPM IT9.17-xxxx *For Photography – Determination of Residual Thiosulfate and Other Related Chemicals in Processed Photographic Materials – Methods Using Iodide-Amylose, Methylene Blue, and Silver Sulfide*

The most widely used of these test methods is the Methylene Blue. Use of the Iodide-Amylose method is required when testing for residual thiosulfate in photographic papers having incorporated developing agents. The Silver Iodide method is used when films have been processed more than two weeks prior to testing for residual thiosulfate. This time-consuming test method is relatively insensitive when compared with the Methylene Blue method.

ANSI/AIIM MS18-xxxx *Micrographics – Splices for Imaged Microfilm – Dimensions and Operational Constraints* describes acceptable methods for joining two pieces of processed microfilm having silver images; certain methods are unacceptable as they are likely to damage adjacent images or have a deleterious effect on their life expectancy.

ANSI/AIIM MS23-xxxx *Practice for Operational Procedures/ Inspection and Quality Control of First Generation, Silver Microfilm of Documents* describes, in detail, how to inspect silver-based film images of camera original microfilm for various types of filming and other defects.

ANSI/AIIM TR20-xxxx *Environmental and Work Place Safety Regulations Affecting Film Processors* identifies many potential hazards for persons working in the microfilm industry and describes how to work safely in spite of them.

ANSI/ISO 3334-xxxx* *Microcopy ISO Test Chart No. 2 – Description and Use in Photographic Documentary Reproduction*

It is standard practice to make a quantitative evaluation of the resolving power of microfilm recording systems. This standard describes the physical attributes of the various precision images on test targets that are photographed in order to accurately measure the resolution of photographic images recorded on microfilm.

**This is also an international standard, adopted by the International Organization for Standardization based in Geneva, Switzerland.*

But how can one be certain that the thiosulfate level of a specified roll of microfilm is within the limits set forth in ANSI/NAPM Standard IT9.1? There are three test procedures described in ANSI/NAPM Standard IT9.17 that will help. IT9.17 describes the precise steps to be taken in using each of the three accepted test methods for measuring the residual thiosulfate level in silver halide film products.

The first standard that described a test for residual thiosulfate was ANSI PH4.8, which described a chemical test known as the Ross-Crabtree method for measuring the amount of residual thiosulfate in processed microfilm. This test required the user to extract the residual thiosulfate from the film and then to prepare a chemical solution that had a cloudy white appearance. The resulting solution was then visually compared with similar solutions made using precisely controlled concentrations of thiosulfate. The observer was required to make a subjective determination as to which of the standard solutions more closely resembled the solution prepared from the film being tested. This subjective determination as to the correct value to be used resulted in frequent disagreement among those who used the test method.

However, when new and more objective test methods were found, NAPM's standards review committee made additional laboratory tests and determined that any one of the three new test methods would provide improved quantitative results when measuring the residual thiosulfate in processed microfilm. The standard was therefore revised, ANSI published the revision, and the microfilm industry adopted the Methylene Blue test method as the one to be used in most situations. Since that time, there have been several revisions to the standard.

Standards revisions can be extensive, as in the case of adopting the new residual thiosulfate test procedures, or they can be minor, serving merely to clarify or more fully define the procedure.

The Value of Microfilm Standards

For the microfilm industry, there are standards that deal with the actual production of microfilm images, and there are many additional ones that relate to the manufacture of the film stock itself, the preparation of the chemicals used in processing the film, and the construction of film imaging and processing equipment.

For example, there are standards that specify the exact parameters for making the machine screws required in the assembly of the various pieces of equipment used to retrieve and print film-based images. There are standards that describe the physical characteristics of the many lenses used in microfilm equipment. Photographic processing chemicals must be prepared in accordance with adopted ANSI standards if they are to be used in the microfilm industry.

There are also standards that relate specifically to vesicular and diazo film products and for controlling the quality of computer-generated microfilm images. Other standards apply to the production of duplicate microfilm images.

The microfilm industry has developed standards that, when properly applied, will produce film-based images that are of uniform appearance and quality. Film-based images that meet the quality standards set forth in ANSI and other standards can be disseminated throughout the world, and the recorded information can be readily and uniformly copied and retrieved. Because of the standards developed by the microfilm industry, images that have been created and stored in accordance with adopted standards have life expectancy of at least 500 years.

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