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Changing Technology and the Weights and Measures Official

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Technology continues to advance with innovations that become the primary catalyst for new device features and accessories. The marketplace is driven by customer demands for equipment that is more user-friendly and less labor intensive, and all this is made possible by today's computer-based technology. Device standards must be regularly reviewed and updated to address changes in technology and to be responsive to practices in the marketplace. Technology has its advantages, but how should the standards development process be applied to the many technological innovations to weights and measures features?

Uses of Technology-Based Features

There are multiple benefits to the technology that surrounds us. For weighing and measuring devices, the latest technology makes better economic sense for the business owner and consumer if one considers the improvements that can be made to the performance of a device. Corrections can be set over the entire range of measurements made by the device to compensate for errors due to deficiencies within equipment. Devices not only have the capability for a faster response time in providing the results of a measurement, but can also quickly compensate for other factors that adversely affect measurements or alert the operator to a malfunction. Because technology allows for calibrating and reading indications to a higher resolution, there is less uncertainty about the final quantity. Electronic transactions are free of the errors associated with calculations that were once done manually.

Electronic equipment's computerized components allow for interfacing of major components to auxiliary equipment and for connecting components to networks with unlimited communication capability. The operational controls of equipment can be packaged into components that are the thickness and width of a credit card, thus allowing for downsizing equipment and freeing up valuable real estate. Today's equipment also comes equipped with electronic security. Unlike physical forms of sealing a device, electronic security tracks detailed information about changes (e.g., what changes were made and when) to weights and measures parameters such as accuracy and set up features on the device. More devices are moving toward self-service applications that are activated by cash, credit cards, and debit cards, and the customer-operated checkstands equal, if not exceed, those attended by cashiers in many supermarkets.

Could anyone have envisioned how far computer technology would advance that equipment displays would become talking billboards, news monitors, or provide directions? And how should these features be addressed from a regulatory standpoint? Field officials may encounter many innovative ways for setting up features for one device technology. The same device technology may also be used in multiple applications; therefore, it is important to address all relevant standards when technology changes. The

field official may find s/he must invest more time for research in preparation for inspection and test of the latest electronic device. What technological advancements in weights and measures features the field official needs to address are well-developed standards, examination procedures, and up-to-date training.

Standards to Address Technology-Based Features

The design, performance, and use requirements that exist for commercial devices were developed to eliminate equipment that gives false readings, is faulty in construction, is not reasonably permanent in their adjustments, incapable of repeating indications, or facilitates fraudulent trade practices. The primary focus in the development of equipment standards is to address performance criteria. This philosophy allows equipment manufacturers to take different approaches when designing or modifying accessories and features and still comply with device standards.

Any technology that affects the accuracy and validity of a measurement or transaction or the suitability of equipment for use in a particular application requires oversight. A metrological (measurement) feature must be evaluated at multiple levels in the legal metrology cycle. The first step is an evaluation prior to approval for commercial use. Then there are subsequent inspections and tests to verify the device is the same type and functions the same as the device that was approved for commercial use.

New technology not only influences equipment design, but also affects the development of test standards used to verify the performance of devices. The selection of an appropriate field standard should be decided early in the standard development process since it can be costly to replace or bring a test standard up to specifications after its delivery. Specifications, tolerances, and other test criteria will be needed where data demonstrates new test standard technology is appropriate. Laboratories will need to develop test procedures, receive training, and be authorized to conduct calibration procedures for new standards. Field officials must also be trained in the operation and correct use of these standards. Arecent example of this is that of the dynamic small volume prover, which is now recognized in NIST Handbook 105-7, Specifications and Tolerances for Reference Standards and Field Standard Weights and Measures for Dynamic Small Volume Provers.

Field Evaluation of Technology-Based Features

Think of these innovative features as a new way of doing what has been done for decades. The challenges for field officials are to access device identification and security information, verify the accuracy of measurements and indications, determine that the transaction is valid, and ascertain that any interface with other equipment is appropriate. The following are guidelines which might help a field official when encountering new technological features:

1. Determine if the new feature affects the accuracy of measurements, validity of the transaction, suitability of the device for use in that application, and/or compliance with weights and measures requirements.

2. Apply the appropriate Handbook 44 requirements. Instructions for inspection or test of the feature may be addressed in the corresponding sections of the device's Certificate of Conformance.

3. When no requirement exists in a particular Handbook 44 code section, then apply General Code paragraph G-A.3. Special and Unclassified Equipment, where appropriate. This permits the use of requirements from the General Code or other device-specific code sections for equipment is used in similar applications or with similar designs. Paragraph G UR.1.1. Suitability of Equipment requires that commercial equipment be suitable for commercial use with respect to its design, other features, and capabilities. Remember, although the device may be equipped with a new technological feature it should continue to make accurate measurements, be of sound construction, be reasonably able to hold adjustments, be capable of repeating indications, and not be manipulated to falsify any commercial transaction.

4. Work with management to move beyond ad hoc procedures to adopt standards that apply to this metrological weights and measures feature.

Some points to consider in documenting information about the feature:
- Nature of feature (software, auxiliary component, other)
-Device type (single code applies, multiple devices equipped with feature)
-Application(s) (entire use or specific transactions)
-Security (suitable or requires enabling the feature for test)
-Test Standard (if any) necessary to verify the feature or device's performance when equipped with that feature)
-Effect on the measurement process (not detrimental and/or enhances)
-Effect on auxiliary equipment
-Effect on the final transaction
-Reporting the feature in the inspection or test results (requires computations)

5. Does the test and inspection require policy, training, etc., of field staff. Many jurisdictions regularly schedule classroom sessions with hands-on demonstrations of new technology and new features where the original equipment manufacturers are instructors. Some jurisdictions develop policies with specific procedures, frequently asked question (FAQ) sheets, and supplemental instruction sheets that provide guidance on inspection and test of equipment such as tables of test loads and the tolerance break points or audit trail access information for the most commonly encountered brands of a device.

The only constant seems to be the advancement of technology and the ongoing need for a timely response to innovations in measuring devices by the weights and measures community. The U.S. might look to the international legal metrology community and to other standards bodies to learn from their approach to new weights and measures technology. Field and laboratory (metrology, etc.) officials, manufacturers, and academia must work together in groups and task forces to analyze where the need is most urgent, determine what practices need to be addressed, and mobilize their resources to develop

ad hoc and documented guidelines along with training to meet the challenge of rapidly changing technology in the workplace.