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Let it Snow!

Happy New Year!

All of us here at NIST Weights and Measures Division wish each of you a joyous and prosperous 2009.

The newsletter welcomes suggestions on topics you, as a reader, would like to see published in the *Weights and Measures Quarterly*. Ideas can be submitted to owm@nist.gov.

Hydrogen, What's Next?™

U.S. National Outreach and Hydrogen Standards Development

By Juana Williams

Although hydrogen has been in use for 50 years, it was only in 2004 that the weights and measures community began to participate in discussions of the President's Fuel Initiative. The purpose of the Initiative was to lessen the United States' dependence on overseas fuel and to promote a safe, reliable, and environmentally clean fuel source for powering vehicles, homes, and businesses through research and development of the hydrogen infrastructure. The weights and measures community will be a key player in the hydrogen economy just as it has been over the past 120 years that it has taken the petroleum industry to evolve to where it is today. The United States now leads other countries in the number of hydrogen refueling stations with 65 permanent installations and 32 more in the planning stage, according to the Breakthrough Technologies Institute's web site http://www.fuelcells.org/hydrogen/basics. Members of the weights and measures and hydrogen communities are taking advantage of opportunities to exchange information and to gain firsthand knowledge of hydrogen technologies at these installations. This edition of the *Weights and Measures Quarterly* includes updates on recent tours, workshops, and work group meetings meant to further the development of legal metrology requirements for these installations.

If you have questions about any of these activities or the general work of the U.S. National Work Group for the Development of Commercial Hydrogen Measurement Standards please contact Juana Williams by e-mail at juana.williams@nist.gov or by telephone at 301-975-3989.

Vermont Station Tour

In July 2008 Harold Garabedian (Vermont Agency of Natural Resources) provided an informative technical tour of the EVermont hydrogen generation/refueling station and vehicle to 20 members of the National Conference on Weights and Measures (NCWM). Participants in the tour included representatives of state and local weights and measures offices, meter manufacturers, the International Organization of Legal Metrology, convenience store operators, USDA, GIPSA, and NIST WMD.

The Vermont Partners for Sustainable Transportation "Wind to Wheels" demonstration project opened in July 2006. The partnership consists of EVermont, the city of Burlington, Vermont, Public Works and Electric Departments, Burlington Telecom, the U.S. DOE's Hydrogen, Fuel Cells and Infrastructure Technologies Program, Norwich University, Distributed Energy Systems, and the State of Vermont. The project station uses a wind turbine with 50 kW capacity, as its renewable energy source, generating power to run an electrolyzer that produces up to 12 kg of hydrogen per day from municipal water. The station stores hydrogen at 41.3682 megapascals (MPa) (approximately 6 000 psi) since pressures at this level are necessary to ensure a sufficient quantity of hydrogen is delivered in a reasonable amount of time into a vehicle's fuel tank.

The group observed the operation of an Air Products and Chemical Inc. dispenser in use to refuel the EVermont fleet vehicle, a 2006 Toyota Prius, which has an internal combustion engine that was converted by Quantum Technologies to run on hydrogen. The station has the capacity of fueling four to six vehicles of this type per day. At this location, hydrogen measurements are determined based on the pressure differential between the vehicle's fuel tank and station storage tanks rather than the traditional delivery of motor-fuel product through a meter.

These tours continue to spark our interest and give the community a better understanding of the technologies and vehicle configurations that will be part of the up and coming hydrogen economy. The information we gather from these experiences reinforces the need and creates a sense of urgency for the development of appropriate and uniform legal metrology requirements. These requirements must be structured so that they encourage this new technology and comprehensive enough so that they adequately address the variations we may see in manufacturer's designs of hydrogen measurement systems.

September Workshop

On September 23 to 25, 2008, NIST WMD held a Workshop on Commercial Hydrogen Measurement for weights and measures administrators at its Gaithersburg, Maryland, campus. The workshop was made possible through DOE and NIST funding. Nineteen officials representing 8 of the 18 states that have hydrogen refueling stations participated. The workshop participants were weights and measures regulators, and are responsible for field inspection and testing of motor-fuel dispensers and are part of the legal metrology standards developing process.

Presenters from Air Products and Chemicals, Inc. (APCI), General Motors (GM), the National Hydrogen Association, Shell Hydrogen, and NIST covered topics ranging from hydrogen production to hydrogen powered vehicle technology. The workshop provided in-depth information about hydrogen's properties and how these characteristics are considered to ensure efficient and safe storage and use of hydrogen as a fuel for fuel cell and internal combustion engine (ICE) vehicles. Workshop participants learned about the wide variety of uses for fuel cells such as in forklifts and in laptop computers and in powering homes. Participants discovered how hydrogen, unlike others fuels, can be produced from multiple sources such as natural gas, biomass, coal, or from the electrolysis of water using renewable energy sources such as hydro, wind, and solar power. In fact, hydrogen production from many of these sources can take place on site at the station. The presenters also covered the challenges faced in storing and delivering sufficient quantities of hydrogen since stations are few and far in between and in anticipation of the day when a steady stream of hydrogen/fuel cell vehicles are filling up at the "pump."

A primary highlight of the workshop was a tour of the hydrogen refueling operation at the Shell Benning Road station in Washington, D.C. This visit gave participants the opportunity to observe refueling and to drive GM's Equinox fuel cell vehicle. Five of the six islands at the Benning Road station are equipped to deliver conventional motor fuels; however, the sixth island is dedicated solely to hydrogen refueling at 35 MPa and 70 MPa pressures (approximately 5 000 psi and 10 000 psi). The hydrogen refueling equipment on that island looks like the typical retail motor-fuel dispenser cabinet, except for the additional safety feature of a hydrogen sensor mounted in the canopy and deliveries are indicated in kilograms. In this refueling operation, a tanker truck delivers liquid hydrogen at −253 °C (−423 °F) and 0.689 MPa (approximately 100 psi) into a 1500 gallon double-insulated underground storage tank at the rear of the station lot. Liquid hydrogen is compressed and stored at high pressure as gaseous hydrogen prior to delivery. In this particular installation, gaseous hydrogen is measured through a mass flow meter. The meter is located adjacent to the storage tanks and compressor rather than inside the dispenser cabinet.

Based on several observations of the GM Equinox fuel cell vehicle, workshop participants gained more insight on the actual use of refueling equipment. The GM Equinox is powered by a fuel cell system that occupies the same space as the ICE found in the gasoline powered version of this model. It takes only minutes to complete a delivery of hydrogen, at 70 MPa (approximately 10 000 psi), into three carbon fiber storage tanks located beneath the vehicle's rear seats and cargo area. The storage tanks have a total capacity of 4.2 kg (9.26 lb).

The vehicle specifications and the observed fueling process are helpful in the development of test procedures and for establishing specifications for test equipment.

This workshop is the first in a series of workshops that will provide regulatory officials and the service industry with the latest developments in the operation, performance, safety, and legal metrology requirements for hydrogen refueling equipment. Members of the weights and measures community, particularly those responsible for the adoption and implementation of weights and measures regulations for commercial equipment, are encouraged to continue to provide input throughout all phases in the development of the weights and measures criteria that are necessary for the hydrogen infrastructure.

U.S. National Work Group (USNWG) for the Development of Commercial Hydrogen Measurement Standards

By Juana Williams

The U.S. National Work Group (USNWG) for the Development of Commercial Hydrogen Measurement Standards met on August 26 and 27, 2008, at Air Products and Chemicals Inc., Allentown, Pennsylvania. Both the Device Subcommittee and Fuel Specifications Subcommittee met to further the development of legal metrology requirements for hydrogen refueling applications. An overview of key topics discussed by each Subcommittee is included in the articles below. The USNWG Subcommittee's meeting summaries will be available on the NIST WMD web sit at http://ts.nist.gov/WeightsAndMeasures/index.cfm under "W&M Resources" click on the link to "Developing Commercial Hydrogen Measurement Standards." This article provides an overview of the USNWG discussions, upcoming meeting schedule, and related national activities.

USNWG Devices Subcommittee (DS) August 2008 Meeting

The DS revisited several specification paragraphs that apply to equipment design and discussed other paragraphs in the proposed Hydrogen Gas Measuring Devices code that apply to the performance test of hydrogen dispensers.

Design Specifications - The DS agreed that the design requirement which permits making adjustments to the ratio between the indicated and actual delivered quantity of product is intended to apply to elements and features in the system that affect only the indications (e.g. change the flow calibration factor). The DS is also considering further modification to the proposal to include definitions for "device" and "assembly" to further clarify where adjustments are permissible. The DS discussed the inherent design of nozzles that might allow a small amount of air to be trapped during pressurization and result in contamination of the fuel entering the sample bottle. The DS would like some guidance on how to ensure that no connection can occur between a nozzle and vehicle tank when there is a difference in the pressure ratings for these two components.

Performance Tests - The DS recognized that it is possible during the fill process for hydrogen to heat the test tank which introduces uncertainty into the test procedure. This effect along with high pressures during fill may affect the geometry of a tank and affect the test results during the volumetric test methods. The DS agreed to postpone its discussions of the minimum test draft and tank sizes necessary to simulate various fills (e.g., 1/3, 2/3, and 3/3 fill) so that it can harmonize wherever possible with SAE guidelines on fill protocol to be published in December 2008. The DS agreed that the flow rates and pressures achieved during the test should represent those that occur during normal delivery and include the scenario of topping off the tank to demonstrate any variables that have an effect on the system's performance. It is anticipated the SAE report will address fill protocols that avoid over heating and over filling the vehicle tank. If controls on the flow rate are necessary to meet the fill protocol, then the DS will need to address the question of whether or not this feature will interfere with the test of the performance of the dispenser at the manufacturer's declared minimum measured quantity. As the DS began its review of accuracy requirements, equipment manufacturers were not in agreement on the ability of their equipment to achieve the proposed 1.5 % Acceptance Tolerance and 2 % Maintenance Tolerance. The proposed tolerances agree with the maximum permissible errors specified in corresponding OIML Recommendation 139 "Compressed gaseous fuel measuring systems for vehicles." A majority of manufacturers indicate obtaining accuracies of 3 % to 10 % for equipment in use. The DS will continue its discussion of tolerances and user requirements, test procedures, and collection of test data at the upcoming December 2008 meeting.

USNWG Fuel Specifications Subcommittee (FSS) August 2008 Meeting

The August meeting marked Robert "Bob" Boyd's (Linde North America, Inc.) first meeting as Chair of the Subcommittee.

The FSS reviewed draft code proposals for method of sale (MOS) and fuel quality requirements for commercial hydrogen refueling applications.

MOS - The FSS modified proposed requirements for marking and labeling equipment and signage in specific units of measurement for pressure. The FSS now recommends use of the "megapascal" or the abbreviation for that term "MPa" as the SI unit (metric) of measurement for labeling pressures on refueling equipment and corresponding price signage rather than using the term "bar." The numerical value for the pressure rating will follow the letter "H" which identifies the fuel as hydrogen (e.g., H35 or H70). The FSS agreed that the use of MPa is consistent with recent recommendations from the

CSA America and SAE for labeling components with pressure ratings. This modification also agrees with the FSS's decision to follow guidelines in NIST Special Publication (SP) 330 *The International System of Units (SI)* and SP 811 *Guide for the Use of the International System of Units (SI)* for use of the SI measurement system. The FSS also has under review 16 CFR Part 309 "Labeling Requirements for Alternative Fuels and Alternative Fueled Vehicles," which includes the FTC requirements for posting the hydrogen fuel rating on dispensers. In this instance a disclosure of the amount of the principal component of a fuel is expressed as a minimum percentage on a label in a fashion similar to what is now required in octane posting for gasoline pumps.

Fuel Quality - The FSS also discussed separate fuel quality standards for hydrogen fuel cell and internal combustion engine vehicles and a starting point for a fuel quality laboratory manual. The FSS acknowledges there will be differences in the type and level of contaminants and particulates as a result of hydrogen production from different feedstock. However, the FSS agreed to focus on the current proposed standard rather than begin discussions on separate fuel quality standards based on production sources or ICE and fuel cell vehicle configurations.

The current fuel quality proposal is the culmination of work by SAE, ISO, and later work by California. Like California's Division of Measurement Standards (DMS), the FSS agreed to move forward with the currently proposed table that specifies the maximum levels for contaminants and particulates in hydrogen fuel. The DMS and FSS will work with this table as an interim standard until an accredited standards developing organization recognizes this or another fuel quality standard.

California law required the Division of Measurement Standards (DMS) to have hydrogen fuel quality standards in place on or before January 1, 2008. California's interim standard for hydrogen fuel quality took effect on September 11, 2008. To read about this regulation go to http://www.cdfa.ca.gov/dms/hydrogenfuel/hydrogenfuel.html and click on "Hydrogen Fuel."

Quality Laboratory Procedures - DMS continues its work on test procedures using the fuel sampling apparatus it obtained in March 2008. The FSS also agreed that it will consider and not attempt to reinvent laboratory procedures under development by the ASTM. The FSS will work to align the Method of Sale requirements with those in related hydrogen standards and continue its work to address Field Sampling Procedures and a Laboratory Manual for hydrogen dispensing applications.

Next Work Group Meeting

As this article goes to publication both Subcommittees of the U.S. National Work Group (USNWG) for the Development of Commercial Hydrogen Measurement Standards will have met (December 2 to 4, 2008, at MicroMotion, Inc. in Boulder, Colorado).

The hydrogen and weights and measures communities provided only a limited response to the USNWG's request for test procedures and types of equipment that are currently in use to verify the performance of hydrogen refueling equipment. The USNWG must now move forward to establish preliminary minimum specifications for standards, suitable laboratory and field test procedures, and guidelines on the uncertainties associated with gravimetric, volumetric, and master meter test methods with existing input from stakeholders. Test procedures and performance data will be discussed at the December 2008 USNWG meeting.

Hydrogen Proposals Submitted to the National Conference on Weights and Measures Specifications and Tolerances and Laws and Regulations Committees

The USNWG submitted proposals to the 2009 agendas of the National Conference on Weights and Measures Specifications and Tolerances and Laws and Regulations Committees to include items on both Committees' Developing Items Agendas. These new proposals for draft codes are being developed by stakeholders in the legal metrology community and are intended to address the design, performance, and user requirements and test procedures for NIST Handbook 44 and new definitions and method of sale and fuel quality requirements for NIST Handbook 130 for gaseous hydrogen applications. These proposals are being disseminated to encourage input from the weights and measures community on draft criteria and to promote participation of all stakeholders in their further development.

Specifications, Tolerances, Calibrations, OH MY!

Suitability of Equipment – Interpreting and Applying NIST Handbook 44 General Code Paragraph G-UR.1.1.

By Tina G. Butcher

When applying the General Code of NIST Handbook 44 (HB 44), weights and measures officials and industry representatives frequently struggle to uniformly interpret and apply many of the paragraphs in this and other codes of HB 44. While the requirements are intentionally broad to allow maximum flexibility for officials and industry to address individual applications, the broad language sometimes leads to disagreements and even confusion about its intent and sometimes leads to inconsistent application of the criteria from inspector to inspector.

With this edition of the *Weights and Measures Quarterly*, the WMD will begin a series of articles written to assist weights and measures officials and industry representatives address the general subject of "suitability" as it applies to weighing and measuring devices. The first article in the series will begin with this article on the general topic of suitability as well as an article on "computing capability" on computing scales (see page 7, "Computing Capability of Mechanical Retail-Computing Scales"). In future editions of the *Weights and Measures Quarterly* will address other aspects of assessing the suitability of weighing or measuring equipment. This series will not attempt to cover every aspect of suitability or to address every requirement in HB 44 relative to suitability, but rather to address the areas that seem to be creating the most significant numbers of questions in the weights and measures community. With that in mind, if the series doesn't answer all your suitability questions, we would like to hear from you; we may use your question as the basis for a future article.

As you read this series, you will undoubtedly notice some redundancy in the citation of specific requirements in HB 44 or in the statement of certain principles. We believe repeating certain text is necessary so that the articles may stand alone, and we have made an effort to reduce duplication where possible.

Suitability — Overview.

NIST WMD receives many inquiries with regard to the interpretation and application of "suitability" criteria in H44. Some criteria, such as the General Code paragraph G-UR.1.1. Suitability of Equipment, are very broad, leaving the assessment of what constitutes a suitable device for a given application to be made on a case-by-case basis. Other criteria such as General Code paragraph G-UR.1.3. Liquid-Measuring Devices are very specific and dictate absolute limits on a particular parameter such as the maximum division size for various applications. Still other paragraphs such as Scales Code paragraph UR.3.1. Recommended Minimum Load outline specific suitability criteria, but only "recommend" rather than "require" its use.

H44 General Code paragraph G-UR.1.1. (see below) gives us examples of device parameters that can affect the suitability of a device for a given application: weighing capacity (for weighing devices), computing capability (for computing devices); rate of flow (for liquid-measuring devices); character, number, size, and location of indicating or recording elements; and the value of the device's smallest unit and unit prices to name a few. It is important to note that these examples are not all encompassing, and the inspector and device owner must not limit their thinking to only these factors when determining whether or not a device is suitable for a given application. There may be other aspects of a device or its use or installation that affect its suitability in a particular application. Likewise, scenarios and marketplace applications may arise which have not yet been envisioned by the inspector or device user and are, therefore, not adequately addressed in the examples given in G-UR.1.1. nor in any specific code requirement. It is for these reasons that, while requirements may be added to specific codes to address common suitability issues for particular device types, it is unlikely that the need for a General Code paragraph such as G-UR.1.1. will ever be eliminated entirely. It is anticipated that the inspector and device user will always need a broad paragraph to provide flexibility in assessing the appropriate selection and use of a device for a given application.

> **GUR.1.1. Suitability of Equipment.** – Commercial equipment shall be suitable for the service in which it is used with respect to elements of its design, including but not limited to its weighing capacity (for weighing devices), its computing capability (for computing devices), its rate of flow (for liquid-measuring devices), the character, number, size, and location of its indicating or recording elements, and the value of its smallest unit and unit prices.
> (Amended 1974)

General Code Paragraph G-UR.1.1

Assessing Suitability.

So, where does an inspector, a device user, or a device salesperson start in deciding whether or not a device is suitable for a given application?

Communication. First, one of the most important aspects of assessing suitability is communication. Selecting a suitable device for an application requires good communication on the parts of all parties, including the salesperson, the device user, and the regulatory authority, preferably <u>before</u> a weighing or measuring device is installed in a commercial application. This is particularly true when significant installation costs are involved. The economic impact of finding out that a device is not suitable for an application after it is installed is not in anyone's best interest. The salesperson and device owner need to not only understand the requirements in HB 44, but they also need to be aware of any unique jurisdictional policies that might apply. Likewise, the regulatory authority must ensure that any such policies are clearly outlined and consistently interpreted and applied by their inspection staff.

NIST Handbook 44 Requirements. With regard to the requirements in HB 44, a good place to start is by applying G-UR.1.1. In fact, the examples given in the requirements even prompt you to ask the following questions about an application:

Can the device weigh or measure up to the amounts commonly sold? For a scale, is the capacity sufficient for the loads being weighed? Does the user have difficulty phys-

ically fitting loads on the load-receiving element? (For example, if the load-receiving element is not large enough to hold the vehicle or commodity being weighed, the device is not suitable.) For scales or measuring devices, is the device being consistently used only in a portion of its weighing or measuring range, and, if so, is that how the manufacturer intended or designed the device to be used?

For liquid-measuring devices, is the flow rate of the application matched to the device selected? Is the flow rate of the application below or above the minimum or maximum flow rates marked on the device? The manufacturer of the measuring device has designed the device to work accurately and continue to work accurately in normal service within the marked flow rates.

Can the device compute the total price for any transaction for which the device is being used? Is the total price for any transaction greater than what the device can compute? For example, if a gas pump will only calculate to $99.99 before "rolling over," is it being used for sales that exceed that amount? If it is, the device is not suitable.

Can the device be set to any unit price for which products are offered for sale? For example, if a scale can only compute total prices up to $0.59/lb, is it being used to sell products above that unit price? If it is, the device is not suitable.

Are the indications clear and readable? Are they of a size, shape, and character that the customer can understand and see them from a reasonable customer position? Can the customer and the user readily view and understand the indications? General Code paragraph G-S.5.1. (General Indication and Recording Elements) requires that a device's indications be clear and readable and G-UR.3.3. (Position of Equipment) requires the device be positioned so the indications can be read and see the measurement process from a reasonable customer position. G-UR.1.1. asks the inspector to assess whether the indications will be clear and readable if installed and used in a given application. It is also important that the inspector, the salesperson, and the device user put themselves in the place of the customer when making these assessments; remember that weights and measures officials and device operators are accustomed to reading and interpreting device indications, but the average customer is not. Customers should be able to observe all aspects of the weighing or measuring process so they can understand the transaction.

Are there other General Code or Specific Code requirements that would apply? For example, General Code G-UR.1.3. specifies the minimum delivery size for liquid measuring devices. And Scales Code paragraph UR.1.2. Grain Hopper Scales specifies the minimum number of scale divisions for Class III hopper scales used for weighing grain.

Other Guidance and Information. In some cases, jurisdictions may establish policies which will provide additional guidance to the inspector in applying the suitability criteria for a specific device type. Other sources include, but are not limited to NIST WMD and other technical training resources; *Weights and Measures Quarterly* articles and other technical resources; interpretations of the NCWM Specifications and Tolerances Committee regarding the intent of a particular paragraph in HB 44; the application information in National Type Evaluation Program (NTEP) Certificates of Conformance; interpretations of the National Type Evaluation Technical Committee Sectors; and information from the device manufacturer about the intended application for the device.

Summary.

Assessing suitability requires that one ask questions such as those outlined above; consider requirements in the specific device codes; consider past interpretations made by the NCWM Specifications and Tolerances Committee; and consider jurisdictional policies that may apply. Assessing suitability also requires good judgment on the part of the inspector, salesperson, manufacturer, and device user to ensure the consistent and proper application of these requirements and policies for each application.

Selecting a suitable device for a given application will increase the likelihood that: (1) weighing or measuring operations made with the device will be accurate; (2) the impact of inaccuracies that exist in the weighing or measuring process will be minimized; (3) the customer and the operator will be able to read and understand the device indications and readily observe the weighing or measuring process; (4) any calculation of total price by the device will be done accurately; and (5) the weighing or measuring device will continue to provide accurate measurements for the service in which it is being used. Consequently, selecting the right device for the application is in everyone's best interest.

We hope that this series of articles will assist the inspectors, device sellers, and device owners in interpreting and applying the suitability criteria in HB 44. We will try to focus future articles on specific topics of suitability in an effort to provide additional guidance and insight for the inspector and device user to consider. We also hope that this series might prompt inspectors, manufacturers, salespeople, and devices users alike to consider whether or not adding additional specific requirements to the current HB 44 would improve the uniformity and application of suitability criteria.

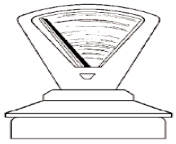
If you have questions about this article, please contact Tina Butcher by e-mail at tbutcher@nist.gov or by telephone at 301-975-2196.

Computing Capability of Mechanical Retail-Computing Scales (An Issue of Suitability for Weighing Devices)

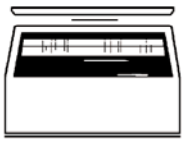
By Rick Harshman

Mechanical retail-computing scales were first manufactured and marketed in the United States in the late 1800's, with U.S. production ending sometime in the early 1980's. Despite production ending more than 25 years ago, weights and measures officials throughout much of the country continue to report a high number of these mechanical devices in commercial use today. Given the design limitations of mechanical computing scales and changes that have occurred in the marketplace over the past 25 years it is questionable whether these devices are still suitable for commercial use. This article will specifically address the limited computing capability available on mechanical retail-computing scales and explain why this limited capability makes these devices unsuitable for use in most applications today.

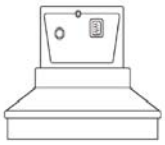
There are actually three basic designs of mechanical retail-computing scales. Only two designs are thought to remain in commercial use in any significant numbers: fan scales and cylinder scales (also known as drum-computing scales). **Fan scales**, as the name implies, describes the fan shaped path in which the indicator of the scale travels from zero balance to full capacity. Fan scales typically have a weighing capacity of 10 lb or less and usually contain no more than 30 unit prices. **Cylinder scales** contain an internal cylinder with a chart attached which rotates in response to loads that are applied. A fixed fine black wire stretched taut across the viewing window serves as the indicator of both weight and total price values. Cylinder scales offer higher weighing capacities (typically up to 30 lb) and more unit prices (usually up to 85 unit prices) than fan scales. Each of these basic designs is easily recognizable by shape and method of indication. **Optical indicating scales,** the third basic design, are believed to have all but disappeared from the marketplace. They operated similarly to the cylinder scale in that a chart moved in response to the load applied, instead of the chart being mounted on a drum it was printed in reduced characters on a translucent reticle attached to the lever system. When a load was applied, the indication was magnified and projected by mirrors to the viewing windows that were observable by the customer and user. Because of their disappearance from the marketplace, the remaining portion of this article is dedicated to fan scales and cylinder scales.



Fan Scale



Cylinder Scale



Optical Indicating Scale

In contrast to electronic retail-computing scales, fan scales and cylinder scales were designed with very limited computing capability. They are able to provide indications of total sale price for a very limited number of unit prices; the values of which were established by the scale manufacturer and appropriately printed on or adjacent to a corresponding price chart. The unit prices typically established for use with the charts reflected commodity prices that were prevalent when the scales were being produced. Given the increase in unit prices of commodities over the past 25 years, these scales (and scales of this design that were manufactured earlier) are no longer able to compute total sale prices of the products they were designed to price. For this reason, most mechanical retail-computing scales are no longer suitable in today's commercial marketplace.

An aspect of unsuitability is the exclusion of a number of unit prices from the price charts established for these scales. Due to physical size limitations of the price charts, it is not possible to achieve the full range of pricing capability desired of these scales using one-cent unit-price intervals. Often, 2, 5, and 10-cent unit-price intervals were used, which extended the overall computing range of these scales and broadened the number of useful applications where these scales could be used. The unfortunate consequence of excluding some unit prices from a price chart is that the scale is unable to provide an accurate indication of the product's total sale price at those unit prices. To facilitate the accurate pricing of all products weighed, merchants must set the unit prices at a price that matches the unit prices included on the scale's chart. Thus, the design of these scales not only limits the number of unit prices that a merchant has at their disposal for products offered for sale, but it also restricts the setting of those prices to a price specifically included on the scale's chart.

G-UR.1.1. Suitability of Equipment. - Commercial equipment shall be suitable for the service in which it is used with respect to elements of its design, including but not limited to its weighing capacity (for weighing devices), its computing capability (for computing devices), its rate of flow (for liquid-measuring devices), the character, number, size, and location of its indicating or recording elements, and the value of its smallest unit and unit prices.
(Amended 1974)

UR.1. Selection Requirements. - Equipment shall be suitable for the service in which it is used with respect to elements of its design, including but not limited to, its capacity, number of scale divisions, value of the scale division or verification scale division, minimum capacity, and computing capability.

NIST Handbook 44 Suitability Requirements: Paragraph G-UR.1.1. Suitability of Equipment and Scales Code Paragraph UR.1. Selection Requirements

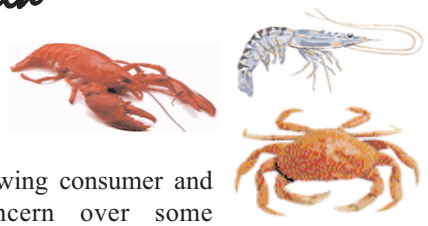
In order to comply with NIST Handbook 44 suitability requirements as they relate to the computing capability of devices that compute, scales equipped with computing capability must be able to compute the total sale prices of all commodities to be weighed using those scales. That is, if the advertised unit price of any product to be weighed on a particular scale with computing capability exceeds the computing capability of that scale, or fails to match one of the unit prices included with the scale's price chart, the device is considered unsuitable for the service in which it is being used. For example, if a fan scale were designed to compute within the range of $ 0.29 through $ 3.59 per pound, it would be suitable for pricing various kinds of products with different advertised unit prices, providing that all advertised prices were within that same range of unit prices and each advertised price matched one of the unit prices included with the scale's chart. However, if any of the advertised unit prices exceeded the maximum computing capability of $3.59 per pound, or was lower than the minimum computing capability of $0.29 per pound, or did not match one of the unit prices included with the scale's chart, the scale would not be suitable. In instances where advertised unit prices do not match one of the unit prices included with a scale's price chart, but are within the range of a scale's computing capability, officials could grant the opportunity to the scale owner to change all unit prices at which commodities are offered for sale to correspond to the unit prices included on the scales chart and thereby avoid outright rejection for failure to comply with suitability requirements.

Can a scale that lacks adequate computing capability be used commercially as a weight-only device if the operator's view of money graduations were to be permanently blocked and the scale conforms to all other NIST Handbook 44 requirements? There may be some limited applications where officials could determine that a non-computing scale is suitable for direct sales to customers. For example, a non-computing scale used to weigh nails in ½-pound and 1-pound bags priced at $1.09 and $1.99 respectively, may be considered suitable. Officials should not accept such modification as an alternative to obtaining a suitable device. Not only is this a modification to the original design, but calculating total sale prices on an analog scale that provides only an indication of weight is subject to error caused by the interpolation of values when indications are between different graduations on the scale or from mistakes made when completing those calculations. Considering the value of their minimum scale division, most mechanical retailing-computing scales are graduated in ounce or fractional-ounce divisions, and the prices of today's products offered for sale and sold by weight, even small interpolation errors can cause significant monetary error in total price calculations. Given that most products weighed on these scales today are advertised in pound units, proper conversion of the weight indications from ounces to pounds to enable accurate calculation of total sale is cause for even greater concern.

NIST Handbook 44 requires commercial equipment to be suitable for the application for which it is used. Making the determination of whether the computing capability of a mechanical retail-computing scale is suitable for a given application requires verification that the unit prices of commodities offered for sale and weighed on the scale match those that are included with the pricing chart. This article specifically addresses the limited computing capability available on mechanical retail-computing scales and explains why this feature makes these devices unsuitable for most applications today. Other suitability issues relating to these scales, to include the impact of division size, minimum and average load weighed as they relate to the value of the minimum scale division, etc., will be addressed in greater detail in a future newsletter article. For additional information regarding the application of NIST Handbook 44 suitability requirements towards retail-computing scales, contact Rick Harshman at 301-975-8107 or by e-mail at richard.harshman@nist.gov.

. . . in the field

Seafood Alert!



By David Sefcik

There is a growing consumer and industry concern over some fraudulent packaging and labeling practices in the seafood industry. This is being evidenced by an increased focus on complaints and reported violations of U.S. law by seafood importers.

On October 14, 2008, John Connelly, President of the National Fisheries Institute (NFI) and Lisa Weddig, Director of Regulatory Affairs for NFI, visited NIST Weights and Measures Division. NFI is a non-profit organization dedicated to providing education on seafood safety, sustainability, and nutrition, and has a membership of over 300 suppliers, producers, retailers and wholesalers.

Mr. Connelly and Ms. Weddig discussed NFI's concerns over potentially deceptive practices that may be emerging in the marketplace. They came to solicit ideas on how to obtain assistance from state and federal agencies such as the Food and Drug Administration (FDA) and the Federal Trade Commission (FTC) in their efforts to protect reputable businesses and consumers from unfair trade practices.

NFI explained that reported violations are being seen in three primary areas:

1. *Weight Labeling* - Some packers are intentionally short-weighing. These suppliers are boldly providing their cus-

tomers offer letters showing different price points based on a percentage of short net weight (i.e. 80% net weight for 41 to 50 count shrimp).

Another common short weight fraud is *glazing*. According to NFI, "one of the most common frauds is selling short weight products by adding significant glaze to fish products". One example which needs to be addressed by FDA and FTC is whether it is a permissible practice to call a water, citric acid, and salt glaze a "marinade" and include this "marinade" as part of the net weight.

2. *Species Substitution* – Seafood products that are being sold under an assumed name. For example, various species of Pangasius (i.e. catfish) are being sold as grouper.

3. *Transshipment of Products to Avoid Duties* – Products that are intentionally shipped through different countries or being identified with an incorrect country of origin to avoid duties and tariffs.

In response, NFI sponsored the formation of the Better Seafood Bureau (BSB) to specifically combat fraud in the seafood industry. Since September 2007, BSB has been working with seafood buyers to identify suppliers that have good quality control systems (and those that do not) and those suppliers who meet U.S. law (and those that are not complying) for proper labeling of weight, count, country of origin, and species. Buyers who suspect their suppliers are selling short weight or mislabeled products are encouraged to report them to the BSB at (866) 956-4272. The BSB formally contact suspected violators of U.S. laws and regulations and notifies them of areas of non-compliance and provides them with resources to identify and correct their errors.

NFI has already shared its concerns with the FDA. To move forward, NIST Weights and Measures Division encouraged the NFI to engage the FTC, states, packers, and retailers who are non-members of the association in an effort to educate all parties of the seafood industry's concerns. The goal is to create awareness, identify opportunities, and clarify the responsibility each of us has to ensure equity in the marketplace.

A meeting of all interested parties will be scheduled later this year. If you are experiencing any type of problem with seafood during your inspection and enforcement, we would like to hear from you. Additionally, if you are aware of any merchants in your state that are experiencing problematic seafood marketing practices we would like to know about it so that we can add your input to our efforts to aid NFI and the industry it represents.

Comments or concerns may be addressed to David Sefcik at 3019754868 or by e-mail at dsefcik@comcast.net.

Educational Services

Training Class

Training Offered by WMD Laboratory Metrology Group

By Val Miller and Elizabeth Gentry

Many laboratory staff and management know that the Laboratory Metrology Group has been focusing on the need for "Training and Succession Planning" in State laboratories. As a result of this focus, we have also been discussing the availability of training we offer, it's timeliness for laboratories, the metrology training calendar for 2009 and 2010 as well as additional course offerings that laboratories may need. The current schedule and applications for our seminars are posted on-line at: http://ts.nist.gov/WeightsAndMeasures/Metrology/TRAIN503.cfm

State Feedback Impacts WMD Training Schedule

WMD Laboratory Metrology training availability is a balance between keeping the waiting time for classes low and having sufficient students per class to keep it cost effective. One of the things often not understood is that we will add classes based on significant need/demand. We must have applications 'in-hand' indicating that there is a need before we can add seminars. For instance, if you have a new Metrologist, your laboratory Recognition or Accreditation may be in jeopardy if training is not received in a timely manner. In cases where you do not have trained back-up of staff, your need is urgent! When we receive sufficient interest in holding a course, we may add seminars to the training schedule. But we must know of the need!

Last year we emailed a request for input on needed or desired training, providing likely topics that covered laboratory management, metrology concepts, technical skills, and weights and measures applications for the laboratory.

Based on feedback and questions received we created and conducted two Laboratory Administration Workshops for State Metrologists in 2008. A special Advanced Mass/Advanced Hands-on seminar was held in July 2008 to assist several laboratories who had developed issues with their Recognition or Accreditation at the Mass Echelon I level because of unexpected personnel changes.

The February, a second Advanced Hands-on Seminar is is being held during the week of February 23 – 27, 2009. Anyone who has previously attended an Advanced Mass Seminar is eligible to attend. Qualified individuals interested in participating should submit an application to Val Miller to be added to either of these seminar rosters.

More Laboratory Administration Training in 2009

We are planning two additional Laboratory Administration Seminars. The first one is scheduled for June 22 - 29, 2009, in Austin, Texas, and the dates for the second seminar is yet

to be determined; however, the location is tentatively set for Boulder, Colorado. At this time we are seeking the names of individuals from state laboratories (and industry if there is room available) interested in attending. The seminar includes working sessions to help Metrologists understand what is needed to develop a complete annual submission package for Recognition and touches on management system components from ISO/IEC 17025 and NIST Handbook 143, such as internal assessments and conducting a management review. Time is allotted during the sessions to work on reviewing and updating laboratory documentation. These topics are of great interest to laboratories wishing to gain Accreditation as well.

The feedback received from the participants of the 2008 Laboratory Administration Seminars was very positive, and we hope to see significant improvements in laboratory management system documentation during the 2009 Recognition cycle.

State Laboratory Program (SLP) Training Program Work Group is Established

We have formed a new Work Group to aid in recreating the metrology training offered by NIST Weights and Measures Division. Feedback from seminar participants over the last few years has indicated that changes are needed. The last major revision of our metrology training was conducted in the mid 1990s. Rather than simply re-organizing or restructuring the current curriculum, the decision was made to completely evaluate the training objectives, content, and current laboratory needs using established educational models. The Work Group will be seeking input from our stakeholders as the process unfolds. Please note that the future training schedule may change as a result of Work Group efforts. All changes will be published on the webpage (www.nist.gov/labmetrology).

Other Laboratory Training Available

The Measurement Science Conference (MSC) will be held at the Disneyland Hotel in Anaheim, California, March 23-27, 2009. There will be six NIST Seminars provided on March 23 and 24 on topics including Basic Mass Short Course, Laboratory Accreditation, Estimating and Reporting Measurement Uncertainty, Pressure & Vacuum Measurement and Application, Software Verification and Validation, and Time and Frequency Measurement. There will be 21 half day and full day tutorials offered and more than fifty technical papers and panel discussions on a wide variety of metrology topics during the week. More information about the 2009 Measurement Science Conference can be found on the Web at www.msc-conf.com.

The 2009 NSCL International Workshop and Symposium will be held in San Antonio, Texas, July 26 - 30, 2009. There are typically in excess of 125 metrology related technical papers and panel discussions, plus more than 25 half day and full day tutorials with experts from the field of metrology where discussion of specific metrology issues is possible making this a very informative week. More information about the 2009 NCSLI Workshop and Symposium can be found at www.ncsli.org under the "Conference" link. The NCSL International also provides a listing of other training opportunities available throughout the year. A listing of available training opportunities can be found under the "Calendar – Training" link at www.ncsli.org.

If you have a need/interest in attending a currently scheduled seminar, the proposed Laboratory Administration seminars, or have additional course ideas, please send an email, or fax, to that effect AND include an application for the requested training. We need the evidence that there is sufficient interest in training to be able to justify adding training seminars. Applications can be submitted by e-mail, postal service or faxed to: (301) 975-8091. We encourage you to submit applications to Val Miller, val.miller@nist.gov, as soon as possible.

Calendar of Events

FEBRUARY 2009

2 – 6
Advanced Mass Seminar
NIST, Gaithersburg, MD
Contact: Val Miller, 301-975-3602 or val.miller@nist.gov
Applications at: www.nist.gov/labmetrology

9 – 13
Advanced Mass Hands-On
NIST, Gaithersburg, MD
Contact: Val Miller, 301-975-3602 or val.miller@nist.gov
Applications at: www.nist.gov/labmetrology

25 – 26
NTETC Belt-Conveyor Sector
St. Louis, MO
Contact: Jim Truex, NTEP Administrator, 402-434-4880 or www.ncwm.net

MARCH 2009

2 – 13
Basic Metrology – States
NIST, Gaithersburg, MD
Contact: Val Miller, 301-975-3602 or val.miller@nist.gov
Applications at: www.nist.gov/labmetrology

11 – 12
NTETC Software Sector Meeting
Reynoldsburg, OH

Contact: Jim Truex, NTEP Administrator, 402-434-4880 or www.ncwm.net

23 – 24
MSC Mass Short Course
Anaheim, CA
Contact: 866-672-6327 or www.msc-conf.com

25 – 27
Measurement Science Conference (MSC)
Anaheim, CA
Contact: 866-672-6327 or
www.msc-conf.com

31 – April 2
NTEP Laboratory Meeting
Reynoldsburg, OH
Contact: Jim Truex, NTEP Administrator, 402-434-4880 or
www.ncwm.net

APRIL 2009
19 – 24
Combined Regional Measurement Assurance Program (C-RMAP)
Concord, CA
Contact: Georgia Harris, 301-975-4014 or gharris@nist.gov

MAY 2009
4 – 8
Basic Mass for Industry
NIST, Gaithersburg, MD
Contact: Val Miller, 301-975-3602 or val.miller@nist.gov
Applications at: www.nist.gov/labmetrology

20
World Metrology Day
www.bipm.org/en/convention/wmd/
www.worldmetrologyday.com/

JUNE 2009
22 – 29
Laboratory Administration Workshop
Austin, TX
Contact: Val Miller, 301-975-3602 or val.miller@nist.gov
Applications at: www.nist.gov/labmetrology

JULY 2009
12 – 16
NCWM 94th Annual Meeting
San Antonio, TX
E-mail: info@ncwm.net

26 – 30
NCSL International Workshop & Symposium
San Antonio Convention Center
San Antonio, TX
Contact: NCSLI, 303-440-3339 or www.ncsli.org

August 2009
19 – 20
NTETC Grain Analyzer Sector
Kansas City, MO
Contact: Jim Truex, NTEP Administrator, 402-434-4880 or
www.ncwm.net

25 – 27
NTETC Weighing Sector
Columbus, OH
Contact: Jim Truex, NTEP Administrator, 402-434-4880 or
www.ncwm.net

SEPTEMBER 2009
20 – 24
WWMA Annual Conference
Hotel Encanto de Las Cruces
Las Cruces, NM
Contact: Joe Gomez, 575-646-1616
E-mail: jgomez@nmda.nm.su.edu

OCTOBER 2009

2 – 3
NTETC Measuring Sector
Clearwater Beach, FL
Contact: Jim Truex, NTEP Administrator, 402-434-4880 or
www.ncwm.net

4 – 7 (tentative)
SWMA Annual Conference
Clearwater, FL
Contact: Max Gray: 850-488-9140 or
Steve Hadder 850-487-2634

26 – 30
Basic Mass for Industry
NIST, Gaithersburg, MD
Contact: Val Miller, 301-975-3602 or val.miller@nist.gov
Applications at: www.nist.gov/labmetrology

NOVEMBER 2009
2 – 6
Intermediate Metrology
NIST, Gaithersburg, MD
Contact: Val Miller, 301-975-3602 or val.miller@nist.gov
Applications at: www.nist.gov/labmetrology

For meetings and events for the **American Petroleum Institute (API)**, please check the API website at www.api.org and click on the Meetings and Training Section under the "Energy Professional Site" bullet on the left-hand portion of the home page. Information for **American Society for Testing and Materials (ASTM)** meetings is available at www.astm.org on their Internet website. Click on the

"Meetings" bullet on the left-hand portion of the home page. These meetings and seminars are updated on a continuous basis.

For information regarding **American National Standards Institute (ANSI)**, click on the "Meetings and Events" bullet on their website at www.ansi.org. For information regarding the National Conference on Weights and Measures (NCWM), please check the NCWM website at www.ncwm.net.

If you want your meeting, conference or training session included in the Calendar of Events, please contact WMD at 301-975-4004 or owm@nist.gov.

NOTE: An updated calendar showing scheduled events and training can be found on the Weights and Measures Division Website at:
http://ts.nist.gov/WeightsAndMeasures/calendar3.cfm