November 2007

What's Next in Hydrogen?
Part 2
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U.S. National Work Group (USNWG) on Hydrogen Measurement Standards

On October 3 - 4, 2007, NIST held the first meeting of the USNWG for the Development of Commercial Hydrogen Measurement Standards at its Gaithersburg, Maryland, campus. The meeting was sponsored by the U.S. Department of Energy (DOE) and NIST and made possible due to funding from the American Competitiveness Initiative and a DOE/NIST Interagency Agreement (IAA). The goals of the work group are to establish a comprehensive set of device, fuel quality, and other legal metrology standards for equipment used in commercial hydrogen measurements for vehicle and other refueling applications. The ultimate goal is to establish standards that ensure the accuracy of measurements, enhance consumer protection, foster fair competition, and facilitate economic growth and trade.

Meeting participants represented federal and state governments, type evaluation laboratories, fueling sites, refueling equipment and component manufacturers, and product suppliers. Most participants have agreed to join the USNWG. Many participants have experience with various codes and standards developing organizations, on technical committees developing weights and measures standards. NIST WMD provided an overview of its long-range plan for developing hydrogen standards and a description of its nonregulatory, technical advisory role. NIST WMD also explained how the U.S. weights and measures community works through the public and private sectors in the development of appropriate legal metrology standards to familiarize the USNWG with the due process that is provided to all stakeholders.

The standards development process begins with the introduction of a well-developed proposal by the USNWG. However, it is critical that the entire weights and measures community be involved in all stages of the process and eventually the field trials of test procedures that are based on those standards. Through the DOE/NIST IAA four weights and measures officials from California, Maryland, and Florida who have experience working with cryogenics, compressed gases and hydrogen related issues, and motor-fuel quality specifications, participated on the USNWG.

The USNWG examined other standards and some current issues influencing the development of a Draft NIST Handbook 44 Hydrogen Gas Meters Code. The USNWG had lengthy discussions about work in the early 1990's by the weights and measures community to develop similar standards for Compressed Natural Gas (CNG) dispensing equipment and the current work to develop hydrogen fuel quality standards and sampling procedures. These discussions laid the groundwork for how the mass metering code came about and raised the USNWG's awareness on the possible effects of contaminants on product purity and on measurement accuracy and sampling procedures. Currently, multiple agencies and organizations are working on fuel quality specifications. The primary focus and starting point of the USNWG's discussions on proposed device requirements was the 2nd Draft of a Hydrogen Gas Meters Code developed by NIST WMD. The USNWG reviewed the 2005 comments on the 1st Draft, which resulted in a 2nd Draft Code (2007) and recent comments. The USNWG made progress in its review of the 2nd Draft of the Hydrogen Gas Meters Code and reached several conclusions in the three areas where legal metrology standards must be addressed:

Dispensing Equipment or Systems:

(1) Concurrent work should take place to develop the equipment code and test procedures since tolerances for test standards must be considered to determine if equipment tests can be properly made in a

manner where the combined errors and uncertainty for a test method are within acceptable limits specified in NIST Handbook 44 Fundamental Considerations.

(2) The USNWG clarified the intent of design and user requirements for computing type equipment, indications, hose pressurization, and zero set-back interlocks, in part, because there are differences in how these features function in hydrogen applications.

(3) The USNWG supports a ± 1.5 % performance tolerance for equipment undergoing type evaluation at this stage of the discussions.

(4) Equipment requirements will be established first for compressed gaseous hydrogen and developed later for liquid hydrogen dispensers.

(5) The USNWG considered an approach for determining the effects of product purity on equipment accuracy. The USNWG discussed percentage levels of contaminants in product composition based on the heaviest element that is encountered as a contaminant (e.g., Argon).

Method of Sale Requirements:

(1) The most appropriate unit of measurement is the kilogram rather than a gasoline gallon equivalent (GGE), which is arrived at based on an average product composition rather than product composition at the time of measurement. The USNWG discussed use of the cubic foot unit of measurement but opposed the use of that unit because its value varies among standards bodies.

Fuel Quality Standard:

(1) This work, which should be part of a subcommittee of the USNWG, should be covered at the upcoming 2008 meeting.

(2) Hydrogen/CNG blends will be addressed under CNG applications.

Plans are being made for a second meeting of the USNWG, tentatively scheduled for February/March 2008 in Sacramento, California, at the California Fuel Cell Partnership. The first portion of that meeting will be to continue work on the 2nd Draft of the Hydrogen Gas Meters Code (the equipment standards); the second portion of the meeting will be dedicated to a discussion on fuel quality standards and will consider if product composition affects measurement accuracy and/or is the basis for the sales price per unit of measurement. Fuel quality experts are encouraged to participate by becoming members of the USNWG or forwarding written comments to this subcommittee. In 2008 NIST WMD has tentative plans for three additional USNWG meetings.

A final summary of the first meeting is planned for November 2007.

As part of its outreach to State and local Weights and Measures (WM) programs, NIST WMD held two WM Administrators Workshops in October 2007. The 50 U.S. State WM program directors were invited to participate in these sessions. The workshop agendas included a presentation on the work to develop hydrogen measurement standards and an overview of hydrogen and fuel cell technology. During the Dallas, Texas, Administrators' Workshop State Directors heard a presentation on "Hydrogen Behavior – Myth Busting" given by Dr. Andy Lutz of the Sandia National Laboratory, Livermore, CA. Dr. Lutz's presentation provided a scientific basis for hydrogen safety in specific scenarios and dispelled some myths about hydrogen's properties. Two WM Administrators workshops, planned for 2008, will be dedicated solely to issues related to hydrogen.

Involvement of weights and measures administrators, officials, and industry experts is key to the timely development of commercial hydrogen equipment, method of sale, and fuel quality standards and test procedures. Now is the time, while the USNWG is in the early stages of the standards developing process, for all interested parties to provide technical input. If you would like to participate in or observe the work in 2008 and beyond, please contact Juana Williams by email at juana.williams@nist.gov or by telephone at 301-975-3989.