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Inspecting and Testing Electronic Carcass Evaluation Devices

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This is the fifth in a series of *Weights & Measures Quarterly* articles intended to familiarize weights and measures field officials and administrators with electronic carcass evaluation device standards, operation, inspection, and testing. Previous articles are archived for your review on the WMD website at http://ts.nist.gov/WeightsAndMeasures/newsletterarchive.cfm.

This article and subsequent articles in the series describe additional devices or systems currently in use commercially and others currently being used in non-commercial applications, but which have the potential of commercial use. For each device or system, the articles will provide an overview of the base technology utilized and how the equipment functions, as well as test methods and reference material or physical standards currently available for use in conducting accuracy verification.

NIST Handbook 44 includes a tentative code—Section 5.59. Electronic Livestock, Meat, and Poultry Evaluation Systems and/or Devices-Tentative Code. It is important that field officials begin evaluating these devices to determine if any changes are needed to the tentative code.

This article addresses a vision system built by RMS Research Management Systems USA, Inc. The term "vision system" applies to an evaluation system using a digital camera to record a photo of a carcass or portion of a carcass that is then analyzed by a computer incorporated into the system. This system utilizes a digital camera and a large computer database of photos with known measurement values to evaluate measurements taken at a cut in the loin area of a beef carcass. As the carcasses are moving on the packing plant rail system, a digital camera (see Figure 1 below) is placed on the loin cut of the carcass. A digital photo of the rib eye section is captured and sent to the system computer where it is compared to the database of photos with known measurement values to determine several measurements for the carcass being evaluated. As shown in Figure 2, the system provides a measurement of the length (between the horizontal lines) and width (between the vertical lines) and the total area of rib eye, the fat thickness at several places on the back side of the loin (the slanted lines), and the percent of marbling in the rib eye.

Figure 1

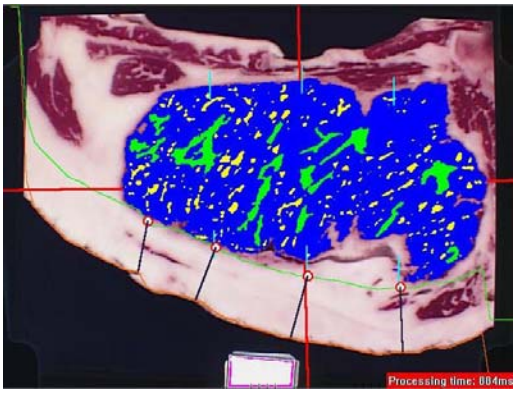

Figure 2

Although this system is not currently being used for determining values for commercial purposes, one installation has been given approval by the United States Department of Agriculture (USDA) Agriculture Marketing Service (AMS) for providing the measurements of the rib eye area—one of the characteristics used in determining the yield grade of carcasses being evaluated. The yield grade is a factor used in determining the value of the carcasses for payment to the livestock producer.

In a recent study involving an official cutout test for verification, the system provided more consistent results than those of trained grading officials. A cutout test is a laboratory test where all tissue is removed from the bones and analyzed for actual fat content.

This system is also capable of providing color measurement information that may be used for value determination of beef carcasses in the future.

Calibration of the system is a relatively simple process and uses “calibration standards” developed by the device manufacturer. The calibration standards consist of calibrated

photographic plates shown in Figures 3 through 5 below. These plates are used to calibrate the computer database of photos that is compared to digital photos of actual carcasses captured by the system camera.

Figure 3

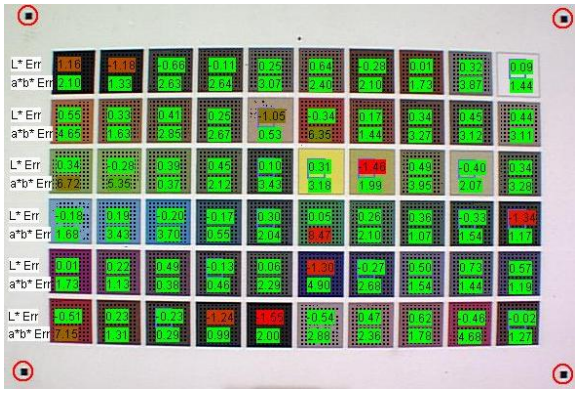

Figure 4

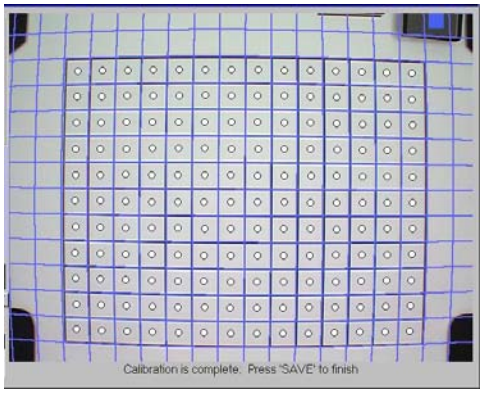

Figure 5

Detailed test procedures for these devices are being developed for eventual addition to ASTM Standard-F2343-06[1]. If these devices are to be used commercially, the device user is required to maintain a set of test standards with the device and is required to perform this procedure at the beginning of each production day. The standards maintained on site by the device user are required to meet NIST Handbook 44, Appendix A Fundamental Considerations, Section 3. Testing Apparatus, which requires the combined error and uncertainty of the standard to be less than one-third the applicable device tolerance. The user of the device is also required to have the accuracy of the test standard verified on an annual basis with traceability to a national standard.

Weights and measures officials may elect to witness such testing on a periodic basis or may choose to conduct their own test using either their own standards or the standards maintained on site by the device user.

Subsequent articles in this series will provide information on other technologies used to make measurements of various carcass constituents. These articles will provide

information on how the various technologies operate and how they are used, as well as inspection and testing procedures developed for each type of device or system.

For further information or questions related to this article, contact Dick Suiter (NIST) by e-mail at rsuiter@nist.gov or by phone at 301-975-4406.

[1] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org.