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Inspecting and Testing Electronic Carcass Evaluation Devices

By Dick Suiter

This is the third in a series of W&M Quarterly articles intended to familiarize weights and measures field officials and administrators with electronic carcass evaluation device standards, operation, inspection, and testing. The first article, published in November 2005, discussed the four documentary standards applicable to electronic carcass evaluation devices during inspection and testing in the field. The second article, published in June 2006, described the Fat-O-Meat'er™ built by SFK Technology, Inc. This was the first device used by the U.S. pork-packing industry for measuring back fat and depth of the loin eye. This article and subsequent articles in the series will describe additional devices or systems currently in use commercially and others being used in non-commercial applications, but which have the potential for 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.

Since the 2006 edition of NIST Handbook 44 includes a new 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.

In this article we will look at the AutoFom™ (automatic Fat-O-Meat'er) built by SFK Technology, Inc. This device utilizes ultrasonic energy of sound waves for measuring back fat and depth of the loin eye. The measuring principle used by the AutoFom™ is one of digitized, three-dimensional scanning. The scanning pattern is provided by 16 ultrasonic transducers embedded in a fixed stainless steel transducer array. The transducer array is located in a stainless steel trough. Carcasses are pulled or slid through the trough (Figure 1). As the carcasses pass over the transducer array (Figures 2 & 3), the transducers provide a cross-section image for every 5 mm in the length of each carcass. Each of the 16 transducers produces approximately 200 measurements for a total of approximately 3200 measurements for the average carcass. By sampling all 200 measurements from one transducer, it is possible to produce a slice of the carcass in the length direction. Sampling the slices from all 16 transducers provides a three-dimensional image of the back side of the carcass (Figure 3).

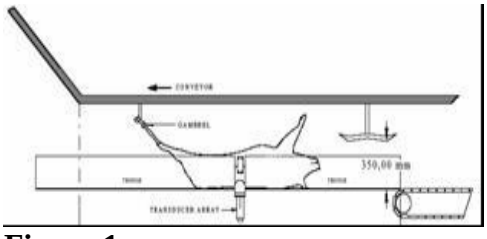

Figure 1

Figure 2

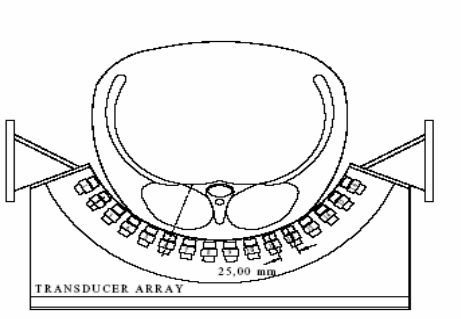

Figure 3

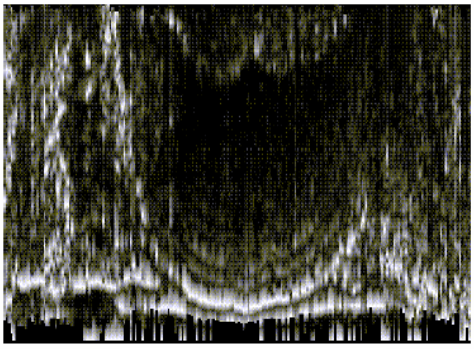

Figure 4

From the three-dimensional image, (Figure 4) the system software determines, indicates, and records measurements of the external fat thickness and the loin muscle thickness.

Testing of the device is a relatively simple process of conducting linear measurements using a "calibration standard" that was developed by the device manufacturer (Figure 5). The calibration standard consists of stainless steel rod whose length can be verified by an appropriate laboratory. The rod shown in Figure 5 has a nominal length of 100 mm. Initial calibration and subsequent testing is conducted by placing the standard on each transducer using a small amount of a gel substance to assure sonic transfer. The readings obtained should be equal to the length of the calibration standard.

Figure 5

The United States Department of Agriculture (USDA) performs tests of the device by placing the standard on each of the transducers 10 times and comparing the readings shown on the display with the calibrated values for the test block. This procedure verifies both accuracy and repeatability.

Similar, but more detailed test procedures for the AutoFom™, were approved May 1, 2006, and added to ASTM Standard-F2343-06. (See the ASTM website at www.astm.org, or contact ASTM Customer Service at service@astm.org for referenced ASTM standards.) The device user is required to maintain a test standard 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 the NIST Handbook 44, Appendix A Fundamental Considerations Section 3. Testing Apparatus.

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 describe devices or systems currently being used commercially for making measurements that are used to determine the value of harvested animals by the meat-packing industry as well as some devices or systems currently being used on an experimental basis, but which may be used commercially in the future. 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.

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