March 2003

ASTM Committee F10 on Livestock, Meat, and Poultry Evaluation Systems

By: Dick Suiter

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Prior to the NCWM 2000 Annual Meeting the Grain Inspection, Packers, and Stockyards Administration (GIPSA) branch of the United States Department of Agriculture (USDA) approached NIST and the NCWM to discuss the development of standards for devices used to measure fat content in animal carcasses. When it was determined that neither the NCWM nor NIST had the available resources needed to develop such a standard, the American Society for Testing and Materials (ASTM) was contacted as a potential standards-writing body to guide the task of developing the desired standard.

The ASTM agreed to develop standards known as ASTM Standard F10 on Livestock, Meat, and Poultry Evaluation Systems for the measurement of fat and other quality constituents in animal carcasses.

The devices used to evaluate the various constituents of animal carcasses play an important role in determining the value of the carcass for which the producer is paid. In most cases the devices perform functions that are considered commercial in nature. When the ASTM F10 standard is complete, the NCWM should consider developing requirements for these devices based on the final document.

The USDA reports that 35.2 million head of beef and 93.7 million hogs--a combined value of $37.1 billion--were slaughtered in 2000. The USDA estimates that carcass evaluation systems were used to determine the value of the hogs processed in 36 pork plants in 15 states that process 84 percent of the nation-wide total. Until a few years ago, carcass evaluation for hogs dealt strictly with the weight and perhaps a subjective visual assessment of the fat and lean ratio. Today's consumer demands pork products with all the nutrition they are accustomed to, but with less fat and fewer calories.

In the past 10 to 15 years as pork packing companies started measuring carcass composition in terms of fat-to-lean ratio, producers have developed the new "ultra-lean hog." Instrumentation and systems that can take linear measurements of fat and lean and calculate a lean percentage with an acceptable degree of accuracy have made this possible. Some of the systems are very sophisticated networks that can process multiple measurements rapidly enough to keep up with chain speeds in plants that process 1200 hogs or more per hour. Nearly all hogs processed in this country are evaluated for lean content and for most, this information is transferred back to the producer through some economic incentive program.

The measurement systems include the low-tech ruler used to measure the depth of fat at the midline split of the carcass. Higher tech optical probes use light diffraction to measure the depth of the fat and the depth of the lean in the loin area. Still higher tech hand-held ultrasonic devices use sound waves to produce measurements similar to those made by the optical probe. A sophisticated ultrasonic device called the Autofom uses 16 transducers in a saddle arrangement to measure a carcass every 1/2 in (12.7 mm) as it is pulled through a trough containing the transducers. The latest technology for measuring composition in hogs is the TOBEC, "total body electrical conductivity" instrument. This device, consisting of a tube containing a magnetic field that actually measures the ions to calculate water content, can be used with a high level of accuracy to predict lean composition. The TOBEC is considered by many to be the most accurate of all systems but is not compatible to the high-speed operations found in most large packing plants. Other constituent variables such as pH, color, water holding capacity, and marbling are being considered by both the pork and the beef industry. Devices to determine some of these additional variables in pork are being developed and used on a trial basis.

The beef industry is also using electronic evaluation devices on a trial basis. Recently representatives from the USDA and NIST Weights and Measures Division witnessed the use of a new vision system for determining the value of a beef carcass. The system utilizes a digital camera that takes a picture of the loin area of a moving carcass. The digital camera provides a color photo to a computer that analyzes the digital image for various quality constituents such as the thickness of fat, depth of loin eye, color, and marbling. By comparing the image to a database containing "standards" for the various constituents, the system can determine grade and yield information for each carcass. When the trial phase is complete, this system has the potential of replacing human meat graders who make a somewhat subjective grade and yield determination for nearly every beef carcass processed in the United States.

The ASTM Committee F10 on Livestock, Meat, and Poultry Evaluation Systems is making progress developing a standard for the design, performance, use, and predictive accuracy of devices currently being used or being tested for evaluating several constituents that may be used to determine the value of an animal carcass at the time of slaughter. The four subcommittees – F 10.10 Design Specification, F10.20 Device Performance, F 10.30 User Require-ments, and F 10.40 Predictive Accuracy – have each developed a draft standard for its respective portion of the total ASTM Standard F10. The drafts from F10.10 and F10.30 have been posted on the ASTM website (http://www.astm.org/) for balloting by members of the full committee.

For additional information on F10 or on becoming a committee member, contact Dick Suiter (NIST) by e-mail at rsuiter@nist.gov or by phone at 301-975-4406. ♦