

An extensive review of FGIS grain inspection and monitoring data, which represent over 4,200 samples, provides standard deviation values for each of the mandatory factors across all grade levels within the corn standards. Standard deviation is a measure of variation; and a particular type of standard deviation, the standard deviation of the difference (SDD), can be used as a measure of reproducibility. When a sample is reanalyzed for a particular factor, the reproducibility of results improves as the SDD becomes smaller.

The review of inspection data resulted in separate SDD values for each grade level for both domestic and export corn samples. Only the export SDD values, however, were calculated from raw TW data reported to the nearest tenth of a pound. Comparison of SDD values between factors will therefore focus on the export values. For TW, the SDD value was the same, 0.366, for all grade levels, thus indicating an insignificant range and a consistent reproducibility in TW values across all grade levels. For damaged kernels total (DKT), the SDD values ranged from 0.853 to 1.814 for U.S. Grade Nos. 1 to 5. For BCFM, the corresponding values ranged from 0.197 to 0.359 for U.S. Grade Nos. 1 to 5. The range in SDD values reflects the range in DKT and BCFM levels and the variance in the reproducibility of results across grade levels.

The TW SDD values are either close to or lower than the SDD values for the other factors when all raw data used in the calculation of the SDD values had been reported to the nearest tenth. It can be inferred from SDD values that the reproducibility of TW results is similar to or better than the reproducibility of DKT and BCFM results. The industry accepts the current practice of reporting DKT and BCFM results to the nearest tenth. Therefore, based on the comparison of SDD values, the industry may also find the reporting of TW to the nearest tenth of a pound acceptable.

Another consideration for the industry is that virtually all TW results are currently rounded down. For example, under the current reporting method, a scale reading 53.99 pounds per bushel is certified as 53.5 pounds per bushel which would meet the TW grade limit for U.S. No. 3 corn. If the results, however, were rounded to the nearest tenth of a pound, the resultant 54.0 pounds per bushel would meet the grade limit for U.S. No. 2 corn. In general, the current practice of rounding down causes TW to almost always be underrepresented throughout the marketing channel. Furthermore, the rounding of TW results to the nearest tenth of a pound will not significantly

affect the assigned grade, since in most cases the rounded result will fall within the grade requirement.

#### **Stones**

FGIS proposes to eliminate the count limit on stones and reduce the aggregate weight tolerance from more than 0.2 percent by weight to more than 0.1 percent by weight. Stones have a harmful effect on corn quality and milling. Several industry representatives have requested that the count limit on stones be eliminated and the aggregate weight tolerance be reduced from more than 0.2 percent by weight to more than 0.1 percent by weight. The elimination of the count limit would serve to further tighten the tolerance of stones by allowing a smaller number of heavy stones to downgrade a sample.

#### **Stress Crack Testing**

FGIS proposes to offer corn stress crack (SC) testing as official criteria under the United States Grain Standards Act. This testing service will be optional and FGIS will recover the cost of providing this service through the applicable inspection fees as set forth in section 800.71(a) of the regulations.

Corn kernels which contain stress cracks tend to break apart, and, as a result, are undesirable in the corn dry milling, wet milling, and food manufacturing processes. In the dry milling process, cracked kernels yield lower percentages of large flaking grits which are the highly valued prime product (ref. 1). Starch recovery, which is an essential component of the wet milling process, is also lower from kernels possessing numerous stress cracks. To the food manufacturer, stress cracks are of concern because of the adverse effect on soaking which is an essential component of the manufacturing process. Some snack food companies currently limit the percent of kernels with stress cracks to values less than 20 percent (ref. 2). Cracked corn is also more difficult to store than undamaged corn, since cracked corn is more readily attacked by microorganisms and is difficult to aerate uniformly.

Cracked corn could also contribute to increased elevator dust levels and, thus, negatively impact elevator safety.

Commentors addressed the various detrimental effects of stress cracks and broken corn, and the majority of commentors recommended that FGIS offer stress crack testing as part of the national inspection service. Due to the importance of stress crack testing, GIPSA proposes to offer stress crack testing, upon request, as official criteria. GIPSA and the official agencies of the

national inspection system will use the method recommended by the Illinois Crop Improvement Association's Identity Preserved Grain Lab (IPGL) which performs stress crack tests on over 4,000 corn samples per year. FGIS will use this method because it is cost-effective, easy to use, and quick.

As described by the IPGL, stress crack tests are performed on random subsamples of 100 kernels. The kernels are inspected visually on a back lighting lightboard and separated into four categories: no or zero stress cracks, and more than two or multiple stress cracks. The percentage of kernels falling into each category is used to calculate the percentage of stress cracks and a stress crack index as follows:

$$\% \text{ TSC} = [\% \text{ single SC} + \% \text{ double SC} + \% \text{ multiple SC}]$$

$$\text{SCI} = [(\% \text{ single SC}) + (\% \text{ double SC} \times 3) + (\% \text{ multiple SC} \times 5)]$$

where SC = stress cracks, SCI = stress crack index,

and TSC = total stress cracks

The stress crack index is an indication of the multiplicity of stress cracks in each kernel. The weighting factors indicate that corn kernels with double and multiple stress cracks are more susceptible to breakage than kernels with single stress cracks.

FGIS seeks comments not only on the proposal to offer stress crack testing as official criteria but on the reporting method for results. Since the information will be readily available, commentors should address whether the percentage of stress cracks in each of the three categories, single, double, and multiple, should, be reported. If no comments are received on the reporting method, FGIS will report only the total percent of stress cracks and the stress crack index.

#### **Miscellaneous Changes**

FGIS proposes to revise the format of the grade chart in § 810.404, Grades and grade requirements for corn, to improve the readability of the grade chart.

#### **Proposed Action**

FGIS proposes to revise § 810.102, Definition of other terms, by revising section (d), Test weight per bushel. It is proposed that TW in corn be reported to the nearest tenth of a pound.

FGIS proposes to revise § 810.404, Grades and grade requirements for corn, by revising the definition of U.S. Sample grade by eliminating the count limit on stones and reducing the aggregate weight criteria from more than 0.2 percent by weight to more than 0.1 percent by weight.

Comments including data, views, and arguments are solicited from interested