Meal and Grain Sampling[1]

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ABSTRACT

A short history of grain sampling is given and the recent U.S. Grain Standards Act. per U.S.D.A. publication of 1968, is reviewed briefly. Inspection technique depends on the type of sample being used: official sample, type sample or warehouseman's sample. Terms, such as, permissive inspection and exception, are explained. Mechanical grain and meal sampling methods and the equipment used are discussed. A close look is given to their practical application and the mathematics of operation. Facts that point to the future of sampling are given.

Awareness of the quality of anything purchased, from a suit of clothes to a cut of beef, is important. Generally the technique used to match value with price is a forthright inspection of the item. But in the "volume" business, direct contact with each item on the assembly line is impossible. Therefore sampling is a statistically valid technique of obtaining a value-to-price relationship.

Sampling meal or grain is no different than sampling any other commodity. Once a frequency of sampling has been determined and a method of adequate analyzing is derived, one has only to design the object with which to take a sample. In the past, for instance, scoopfuls were considered adequate when inspecting loads of grain. In time, better scoops were designed, such as probes, to reach deeper into the pile, to uncover any hidden defects, and competition resulted in more probes taken to obtain a more representative sample of the lot. However, while speed of handling increased, the laborious methods of sampling stood still. Later, mechanical apparatus were designed to replace the probe or other hand methods, and cross-cutting of the grain stream was adopted as the logical method for sampling.

In 1968, the U.S. Government introduced some sweeping revisions to meet new marketing practices, and grain inspection became voluntary in domestic trading. Also inspection for other than the grade factor was outlined in the revised act. Factors such as bulk density, moisture content and foreign material or damaged kernels were added. In practice, the new law enabled grain and other commodities to be merchandized more quickly. The approved mechanical sampler provides a more representative picture of the whole at a reduced cost, which takes us back to the first point of matching value and price. With the sample being taken mechanically, an official grade can be established without the necessity of an official inspector on site. Grade determination at origin is compared with tests made at termination.

Under the new law of mechanical cross-cutting, both seller and buyer are happier; any discrepancy can be appealed. Deliberate cheating is easier to determine and penalties are tougher. Demurrage, appeals and hold points should be virtually eliminated under the new law. The mechanically sampled lot generally shows less foreign material than the probes did.

The act calls for four types of inspection certificates: the official sample, type sample, warehouseman's sample and the non-lot unofficial submitted sample. The warehouse sampling method (where licensed elevator employees do the sampling) makes official sampling available to the small country elevator. The mechanics of sampling any particulate commodity during gravity transfer is accomplished best by a cross-cut, of pelican-type device. The constant flowing stream of product is traversed by an open mouthed "pelican" which extracts a few particles from all points of the spout in a uniform fashion. By cross-cutting the stream at frequent intervals, a representative sample of the lot being spout-transferred is obtained. Further division of the main cross cut is done through a "divider," a device which samples the sampler. Then approximately 5% of total sample is obtained from each part of the divider. One part can be secured off for the official sample inspector, while others may be used by both buyer and seller as a basis of trade. By this means, an accurate grade can be affixed to the lot and the frequency of sampling is adjustable to meet the requirements of official grading. The Carter-Day Strand Sampler with its official 3/4 in. wide pelican gap, obtains about 1/100,000 the capacity-per-hour rating of the stream, per cut. As an example: a 50,000 bu/hr flow being cut by the sampler, would yield 1/2 bu/cross cut of the pelican. A further division by the divider would yield 5% per sample part, or 5% of 1/2 bu, or .025 bu. By cutting every 20 sec, a statistically accurate accumulative sample of 4 1/2 bu is obtained in 1 hr. Further dividing may be done, with any excess sample returned to the main stream. Besides the 3/4 in. pelican width, the speed of the cut must be constant, approximately at the rate of 100 ft/min. Sampling cuts of every 200 bu or less is optimum.

Sampler manufacturers are anxious to provide good sampling along with durability and reliability. The mechanical sampler user must be aware of limitations (such as operation during choked spout intervals) and must provide a regular schedule of preventive maintenance. As more field data feeds back, new refinements to the USDA approved designs are being made. The pressure to simplify and speed up the wheels of trade will open up new techniques in sampling designs.

Proper remuneration for value received is a must. Buyer and seller depend on a common denominator; good sampling equipments and techniques will provide this service.

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