

NOTE ON MODIFICATION OF THE UDY-MODIFIED WEBER MILL

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Accurate laboratory analysis of grain depends on adequate sample preparation. The surface texture of the sample is a critical factor in the precision and accuracy of measuring the optical properties of grains, *i.e.*, determining protein, oil, and moisture by use of near infrared reflectance. At the U.S. Grain Marketing Research Center (USGMRC), Agricultural Research Service, U.S. Department of Agriculture, Manhattan, Kans., we have been evaluating commercial infrared instruments that are used to estimate grain quality. Watson *et al.* (1) and Williams (2) demonstrated that the particles in ground samples should have consistent size distribution, and so we have evaluated several commercial grinders. Factors considered were: 1) size distribution, 2) uniformity of grind, 3) effect of grind on infrared reflectance measurement, 4) ease of use and cleaning, and 5) durability. The last two items (4 and 5) were as important as the first three because many samples of different kinds of grain were to be analyzed. Also, we wanted a grinder that would grind all grains, including corn, without precracking as required for the Udy Cyclone Mill.

The Udy-modified Weber mill, a laboratory-type hammer mill, satisfied all requirements except ease of use and cleaning. Three factors contributed to these deficiencies: 1) loose tolerance of mating parts that left crevices in which grain particles accumulated, 2) poorly filled screens that were difficult to change, and 3) a poorly designed grinding chamber door held in place by three wing nuts. The door had to be completely removed to clean the mill. We have modified the Udy-modified Weber Mill to minimize those problems.

Because the mill was being extensively modified, we added power-measuring capability at the same time. The motor was suspended with low-friction bearings and restrained from rotating with a small steel beam. Strain gauges on the beam were used to measure the restraining force. Knowledge of the force, dimensions, and motor rpm allows computation of torque, power, and energy of grinding. A Daytronic model 300D-P-71-90 strain gauge amplifier and Beckman model 100500 strip chart recorder with a disk integrator were used to record the data.

Figure 1 shows a standard Udy-modified Weber Mill and Fig. 2 shows the same mill with our modification (GMRC-modified mill). A precision fit, smooth interior mill housing; a hinged, over-center latched door; a close-fitting screen (opening 1 mm) with slide-in installation; and the strain gauge mount with restraining system have been added. Only the motor, shaft, and hammers of the original mill were retained. A less extensive modification would be possible by

¹Reference to a company product name does not imply approval or recommendation by the U.S. Department of Agriculture to the exclusion of other products that may be suitable.

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retaining the original housing, door, and motor mount. In that case, only the interior housing sleeve and screen would be changed, and no provision would be made for measuring power. A set of engineering drawings is available for either type of modification.

The modifications described improved the Udy-modified Weber Laboratory Mill considerably in convenience of use and ease of cleaning. The modified mill is suitable for grinding all types of cereal grains without any pretreatment such as

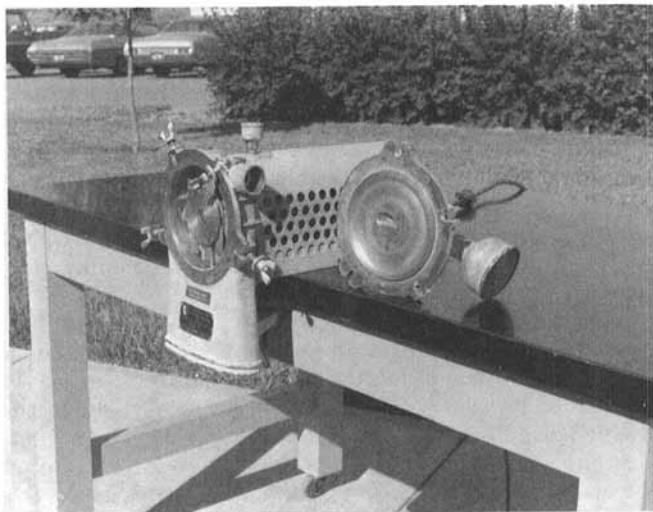


Fig. 1. Udy-modified Weber mill.

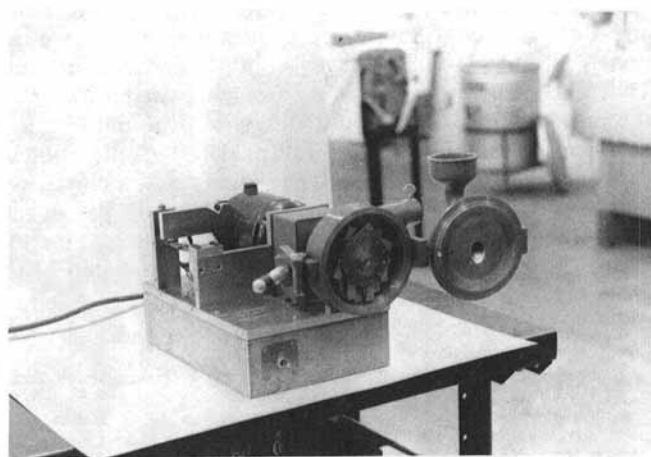


Fig. 2. U.S. Grain Marketing Research Center modified Weber mill with force-measuring strain gauges attached.

precracking the corn, and is used routinely at the USGMRC for grinding all types of grain samples including corn.

Literature Cited

1. WATSON, C. A., CARVILLE, D., DIKEMAN, E., DAIGGER, G., and BOOTH, G. D. Evaluation of two infrared instruments for determining protein content of hard red winter wheat. *Cereal Chem.* 53: 214 (1976).
2. WILLIAMS, P. C. Application of near infrared reflectance spectroscopy to analysis of cereal grains and oilseeds. *Cereal Chem.* 52: 561 (1975).

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