



Moisture Measurement on Grain using the LB 456 Micro Moist

Grain of various types and hardness is drawn off from different silos and around in a mill. The result of milling is essentially affected by the moisture of the grain. Typical moisture contents of grain lie between 10 – 15%.

Goal

The non-contacting, non-destructive moisture measuring system LB 456 MICRO-MOIST is to be used for online moisture determination before the mill. Based on this variable the amount of water to be added may be determined to ensure optimum moisture for the milling process. The required quantity of water may be added in a mixing silo before the mill. The optimum moisture for milling is around 20%, i.e. the grain in the supply silo is always drier than necessary for milling. If the material to be milled is too dry, this may result in impurities caused by husks, etc. If the product is too moist, the grain husk would become too soft and then too hard during milling, i.e. the mill stone would become clogged and smudged.

Measurement Conditions

From the main flow to the mill a partial flow (bypass) is passed through a transparent measurement chamber. The measurement chamber is filled discontinuously. It is ensured that the measurement chamber is always completely filled. Ideal is a measurement chamber volume of approx. 250 x 250 x 350 mm, as, for example, with our measuring chute according to drawing 1318/014-000. The different types and degrees of hardness of grain yield different bulk densities; for this reason, a radiometric weight per area measuring has to be employed.

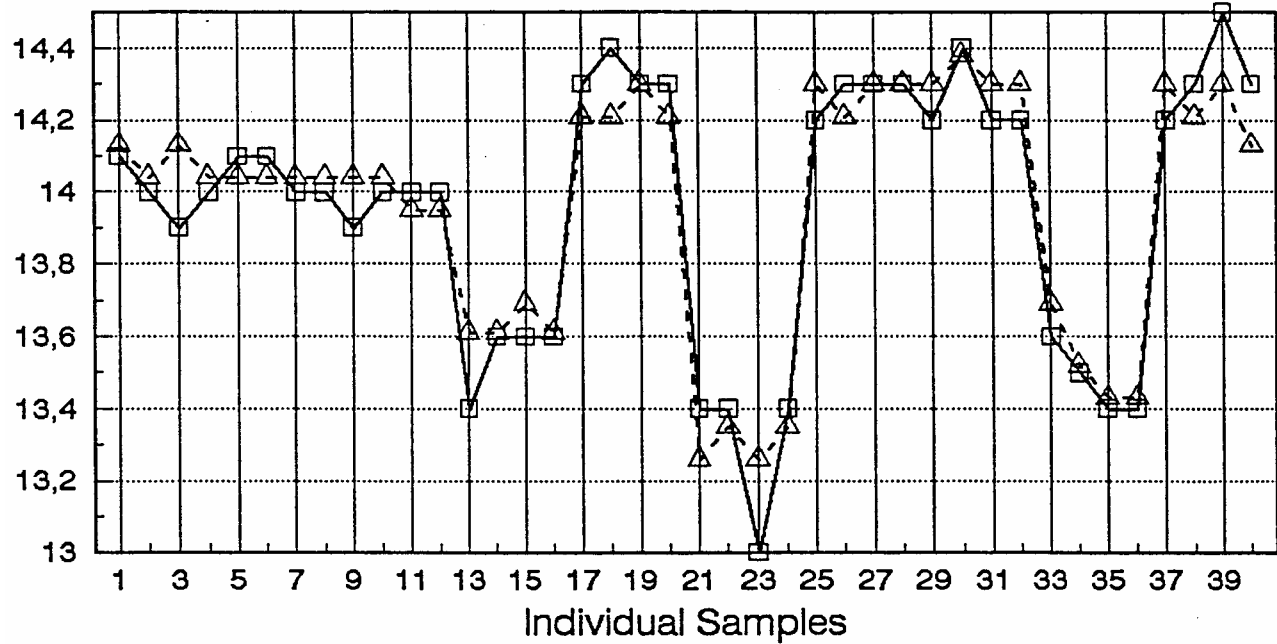
The illustration below shows an assembly without radiometric irradiation measuring path which was installed later.

Result of the Measurement

The moisture measurement is based on a pure phase measurement of the transmitted microwaves. Grain does not have a constant bulk density in the measuring chute; an additional radiometric measurement of the weight per area was therefore required. To assess the accuracy of the measurement, 40 comparative samples were used and their moisture content determined according to conventional laboratory methods.

The comparative laboratory values were plotted on a diagram versus the instrument reading; the linear curve was determined by means of a linear regression. Thus, the calibration coefficients obtained during the start-up procedure could be fine-tuned. The result is shown in the diagram below.

%-Moisture



Laboratory analysis Micro-Moist display
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Microwave phase measurement
 Calibration coefficients A=-0.141, C=-4.81

A simple standard deviation of better than $\pm 0.2\%$ has been obtained. This value is truly remarkable, considering the different degrees of hardness of grain.

The performance of the MICRO-MOIST measuring system fully came up to expectation. Thus, a continuous measurement without the drawback of sampling is available for this type of application. Moisture variations are displayed and can be taken into account by adding the required amount of water in the mixing silo.