

Microwaves Help to Assure Quality (bulk solids handling 05 / 2002)

Moisture content is an essential product parameter in a number of bulk goods. Setting behaviour, processability, storability and durability of a product may depend on the amount of water it contains. Hence a quick and exact as well as reliable moisture measurement is of great importance at different stages of the production process. However, the measurement method needs to fulfil a number of requirements in order to be usable in practice. A method to be used with high-speed processing machinery should not only enable measurements within fractions of a second that are both exact and reproducible, it must also be independent of colour, structure or density. Moreover, industrial production requires robust and long-lasting tools with low maintenance costs and without expensive re-adjustment. A new two-parameter measurement method, the *MoistureScan*, one of the Hamburg-based supplier Döschel & Döschel's recent developments, can now help to fulfil all these requirements at once.

The correlation between water molecules and an electromagnetic field is the decisive variable that is made use of by the two-parameter microwave resonance technology (2PMR). Depending on the place of installation and the product characteristics, cavity or open scattering field probes may be required and are available. In both cases, an electromagnetic field is produced and spreads either inside the cavity probe or in a hemisphere-shape with a maximum height of 50 mm on top of the open scattering field probe. The product is moved into this field, whereby a correlation between the product and the electromagnetic field occurs that is due to two factors. The first is the water molecules' strong polarity that forces them to adjust according to an electromagnetic field when that is produced. The energy needed for this adjustment is drawn from the electromagnetic field and thereby constitutes the energy loss as the decisive parameter. At the same time, the second parameter is determined by comparison between the propagation speed of electromagnetic waves inside the empty and the product-filled probe. This is lower inside a dense product or material than in the air - thus the characteristic resonance of the standing electromagnetic field changes as soon as the product is placed inside or on top of the probe. Subsequently, both bulk density and moisture content may easily be calculated by use of the two parameters.

As the microwaves penetrate the whole product, erroneous measurements due to drying of the surface are avoided and mal-distribution of moisture is balanced. The density-independent measurement method allows a measurement in the product stream, the integration into existing production units is possible without further feed lines. Moreover, neither constant filling height nor bulk density are necessary. Modern semiconductor technology enables measurements within fractions of a second that are both reproducible and long-time stable. Operating independent of colour, structure or surface of the product, the system's adjustment expenses are extremely low. The disk probe has been constructed for industrial use and provides a trouble-free measurement method that enables precise measurements due to the high degree of penetration into the product. The probe's ceramic measuring area is virtually wear-free and insensitive to contamination. Furthermore, its compact construction allows for the probe to be used in various places of installation. The technology has proven itself in long-term use with a large number of users in numerous sectors.