

## Combining Economy and Ecology

*Germany's largest fibre board production plant uses microwave technology to optimise process control*

In November 2001, the starting signal was given: with the KFB Kunz fibre board factory, one of Europe's largest manufacturing plants for medium density fibre boards went into operation in Baruth, east Germany. Kunz is aware of social responsibilities and places particular store by sustainable and ecological production. The new plant constitutes the heart of the new wood competence centre Baruth, in which several stages of production, beginning with the lumbermill of the Klenk Wood AG via the Kunz MDF-plant and the power-and-heat integration plant built by Kunz, to the veneer floor manufacturer Classen Industries, are joined on one spot. The close cooperation of companies in Baruth thus allows to connect economic and ecological aspects.



**Illustration 1: The new of MDF-plant in Baruth**

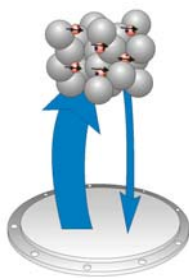
The wood shavings and filings used for the production of fibre boards are provided by the neighbouring lumbermill, thus reducing transportation costs. Optimised process control allows to minimise waste and reuse all waste products, helping to reduce raw material consumption. Modern communications technology enables timely reactions to disturbances and exceeding of limit values and thus avoids costly production standstills. KFB's aim is to achieve an optimal price performance ration through quality optimisation and cost reduction.

### *Microwaves help to assure quality*

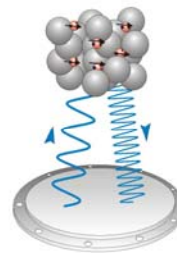
One product parameter that is decisive at all stages of production is the water content of fibres. However, an exact moisture determination during the production process is not unproblematic: many measuring systems show correlations with secondary parameters such as density or temperature of a product, are not long-time stable or can only be integrated in particular locations. Moreover, measuring tools must be robust and low-maintenance and should allow uncomplicated adjustments in order to be suitable for industrial production.

Following a thorough examination of different offers and extensive testing, a decision was taken to provide the plant with innovative microwave moisture measurement systems by the Hamburg-based company Döscher & Döscher. By use of a two-parameter microwave resonance technology (2PMR), these systems allow reliable and continuous measurements which remain uninfluenced by secondary product characteristics.

The technology makes use of the correlation between water molecules and an electromagnetic field in order to determine the exact moisture content of a material. The electromagnetic field with hemisphere-shaped extension is produced on top of the probe. When this field changes its polarity with high speed, only the water molecules, which are small and strong dipoles, can follow these changes and adjust their positive and negative ends according to the polarity of the field. The energy needed for this adjustment is drawn from the electromagnetic field. The resulting energy loss is being recorded and constitutes the first parameter. (see illustration 2) The second parameter is established by comparison between the propagation speed of electromagnetic waves on top of the empty or product-filled probe. Depending on its density, the material constitutes a higher resistance than the air and reduces the propagation speed of the waves. (see illustration 3)



III. 2: 1<sup>st</sup> parameter energy loss



III. 3: 2<sup>nd</sup> parameter propagation speed

Moisture detection is thus independent of density and weight, a constant filling of the probe or preparation of samples is not necessary. The tools are integrated into production lines for permanent use, measurement can be carried out continuously on the moving product without obstructing the production process.

*Exact measurements at all stages of the production process*

At the Baruth plant, measurements were important at the two belt weighers and in the fibre silos on the forming lines. Two measuring tools of the **MoistureScan** type were integrated sideways into the side walls of the band weighers, where they determine the moisture content of dried fibres (see illustration 4).



Illustration 4: Moisture measurement in the band weigher

Depending on many reasons the performance of the drier needs to be regulated by temperature adjustments. An exact moisture determination of the dried product makes this possible. The probes used are open scattering field probes which determine the water content independent of density or temperature and leave the production process uninfluenced.

A third tool, also of the **MoistureScan** type, was integrated at the forming line into the fibre silo (see illustration 5).



**Illustration 5: measuring moisture in the fibre silo**

Before pressing, an exact detection of water content is of particular importance, as this significantly influences the quality of the pressed panels. If the fibres contain too little water, the material lacks heat-conduction and the necessary temperature for the adhesives to bind is only reached on the outside surfaces, while the core of the panel remains brittle and fragile. However, if the moisture content is too high, the extreme pressure of steam produced inside the press may lead to the panels cracking as soon as they leave the press, causing disturbances of the production process or even standstills. Moreover, customers increasingly expect boards to contain a fixed percentage of water in quality control, which can thus be reliably met.

The fourth system is operating after the press and is measuring the water content of the ready pressed panels before moving to the second cooling section.

The systems developed by Döscher & Döscher represent the latest state of microwave technology. In Baruth, a new, patent pending version of the **MoistureScan** was mounted (see illustration 6), for which the well-known method of an additional reference measuring length has for the first time been transferred to microwave technology.



**Illustration 6: the measuring system *MoistureScan***

All tools are centrally operated by a computer, results of the continuous measurements are displayed on the screen. If required by the customer, the manufacturer can carry out adjustments and maintenance works online by remote maintenance. Problems can thus be quickly found out and solved and malfunctions avoided.

Heiko Wolf, technical manager for MDF production at the Baruth plant, was, from earlier co-operation with Döscher & Döscher, already familiar with microwave technology. Good experiences regarding reliability of tools and reproducibility of results were confirmed in tests with the new generation of measurement systems and made the decision for the technology an easy one. Compared to alternative methods, the systems are particularly distinguished by their independence from colour variations and long-time stability, says Wolf. The long-wave microwaves that the technology uses can, in contrast to optical methods, simply not “see” variations in the colour or surface structure of a material. Differences between core and surface moisture are balanced, too, because the waves penetrate the entire product. Density variations of the fibers have no influence. Further advantages of Döscher & Döscher’s systems are the uncomplicated and robust construction of tools, easy operation and uncomplicated calibration, says Wolf. The flash dryer is operating automatically controlled by the measured moisture value. The technology has proved efficient in all places of installation, product and service were equally convincing, he adds.

It seems that in Baruth, economy, ecology and measuring technology are on the same wavelength.