

Trends On Measuring Technologies For On-Line Control In The Wood-Based Panel Industry (1)



Production parameters and measuring methods - Moisture content (MC)

The MC is one of the most important factors in regard to energy consumption and even product quality and has to be continuously controlled throughout the whole production process starting with the incoming raw material, during storage, before and after drying and blending of the particles, continuing with intermediary storage, after mat forming, and finally after hot pressing on the board.

The most common and modern methods for the on-line MC-measurement for wood based panels are micro-waves and infra red light, which are indirect measuring methods. The reference method to calibrate the systems is always direct measuring systems like the dryer oven method.

The fast development of the wood-based panel industry during the last decades resulted in a substantially increased production capacity. Production speed of continuous press lines up to 120 m/min combined with an increasing demand on quality and cost efficiency as well as the large variety of panel types require an advanced on-line control.

The most important measuring parameters for further process steps and the quality of wood-based panels are moisture content, weight per area unit, mat temperature, board density and density profile, thickness and weight of the board. More over, other factors such as surface quality, internal defects (e.g. blisters and foreign bodies) as well as trending and forecast of the board's quality (e.g. density and density profile) are well-established and taken into consideration by on-line measuring systems today.

All these parameters influence strongly the final mechanical properties of the product, e.g. internal bond (IB) and modulus of rupture (MOR), modulus of elasticity (MOE), surface soundness but also physical characteristics like thickness swelling after 24h, free formaldehyde emission, surface color etc.

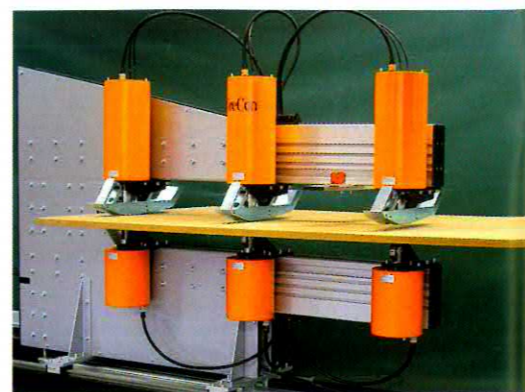
MC - determination by infrared light analyses the moisture of product surface. The infrared light is projected by the measuring device onto the product surface being measured from which a certain part is reflected back.

Known water absorption wave lengths of the infrared light are constantly compared to reference wave lengths where no absorption of the infrared light takes place. The proportion of these intensities gives a proportional supported conclusion to the concentration of moisture or other elements of the product. Changes in the light sources are permanently observed and considered.

Major advantages of this method are that the MC can be measured in a non-contact way by a head in the whole production process. As the installation point of the equipment is known, a first calibration of the IR-System can be preset. To consider are the dependence on the surface colour, external light sources, a constant distance between material and sensor and dust developments.

There is a need for a reliable MC measuring system during the whole production line. An inexactly adjusted MC affects the whole production process. It can lead e.g. to excessive drying costs, to problems with the hot pressing and the thickness of the board, ending up with board defects like blisters, internal bond decreases and additional costs because of the extension of the pressing time.

The more accurate the reference method is (recommended is the oven dry method at lab scale), the more precision



is the on-line moisture measurement. An major aspect is the position of measurement heads in the production line and the implementation degree in the automatic control of the process parameters. The later the information about the MC of particle is available, the longer the time for adjustment of parameters (i.e. dryer temperature or pressing time) and therefore the lost in product quality and costs occur.

Weight per unit area

The weight per unit area should be controlled firstly before the resination (blender), than in the forming heads, behind the forming heads, after or before trimming and sizing of the pressed boards. The measuring results are used to adjust the content of resin and other ingredients and also to control the forming heads for keeping constant the product density and the levelling scalper to secure an even distribution of the particles lengthwise as well as crosswise over the mat.

The weight per unit area are measured online either with a belt scale or in a non-

contact way by X-ray or alternatively by a radioactive source.

The mat or board to be measured is penetrated by X-rays or radioactive beams. Depending on the amount and specific weight of material the radiant intensity measured by the sensor is changed. This is the measure for the weight per unit area (kg/m²). Different measurement transducers are available, depending on material structure and installation places.

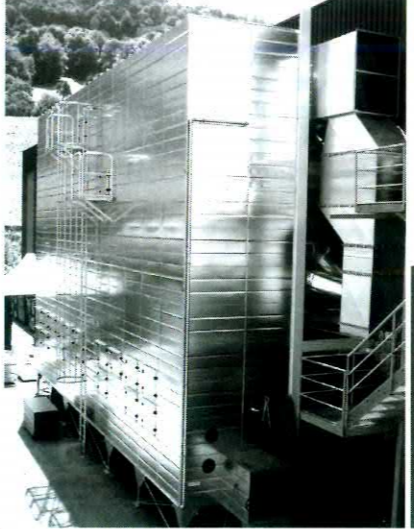
Using the non-contact method most common is the determination of the mat weight area in one representative location or traversing combined with trending by calculation of an average over the whole mat width. With this method, however, there is always the risk for undetected variations of the weight in both mat directions (width and length). This can lead for example to problems in the pressing process and to density variations in the end product. However, there is also a new online measurement system available offering a 100% inspection of the weight distribution cross and lengthwise of the mat/board.

Based on X-ray detection of hazardous particles, this multi-purpose system has additionally a supplementary safety feature for the protection of the steel belts of continuous or calander presses. A long time comparison of two neighbouring HDF-lines with and without a steel belt protection showed that the unprotected steel belt had to replace after 5 years while the protected steel belt had no damage on the surface and is working without interruption. Using a continuous inspection of the whole product simultaneously with a precise control loop for the forming machine it is possible to minimize crosswise and lengthwise density variations. The material savings, depending from the panel type and process, are 4-8 kg per m³.

Part 2 of this article, dealing with thickness, blister detection, board weight and future trends will be published in the upcoming issue.

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