Investigations into the Manufacture of Cardboard in the Dry Process

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Initial Situation and Objective

The manufacture of lignocellulose-based fibreboards in the wet process requires high effort in both drying and the treatment of the resulting sewage. The dry process is an alternative that, for its advantages, is applied today almost exclusively in the manufacture of lignocellulose-based fibreboards.

With respect to the manufacture of cardboard, which is part of the papermaking industry, calculations regarding the consumption of power, water and raw material showed that, compared to cardboard manufacture in the wet process, the dry process is energetically more reasonable and economically more sensible, also with grammages of 800 g/m².

Fig. 1: Folding boxboard of dry cardboard

Modern MDF facilities permit the manufacture of MDF of low thicknesses (thinnest MDF). When appropriately adjusting the properties of these thin MDF, it should also be possible to use them for packaging purposes, substituting cardboard. A prerequisite for that is that these novel thin MDF have cardboard-like properties and can be recycled as waste paper. Therefore, the objective of the investigations was the development of suitable raw material and technology combinations allowing the manufacture of thin MDF of cardboard-like properties (termed "dry cardboard" hereinafter). The dry cardboards should permit further processing into packaging cardboard boxes and recycling via the usual waste paper recycling channels. The grammages under review ranged mainly between 300 g/m² and 800 g/m² (in single cases 100 g/m²), and their thicknesses were in the range between 0.4 mm and 1.0 mm.

Results

The dry cardboard was manufactured by modifications in the processing technology for making MDF. On the one hand, the raw materials (fibrous raw material, including waste paper, bonding agents) were varied or modified, and so were the processes for fibre fleece orientation and the hot-pressing of fleeces, on the other.

Starch, proteins and wheat flour were applied as additivies with a gluing effect. Fleeces of grammages between 300 g/m² and 800 g/m² (in single cases 100 g/m²) at low grammage deviation were manufactured by way of the Airlaid process. Sufficient creasability and foldability, comparable to that of grey board, was achieved by an additional coating with dispersion glue and by the complementary use of graphic paper, so that they allow to be used as folding boxboards. The recyclability of the dry cardboard in waste paper recycling channels could be verified.

The results allow manufacturers of medium-dense fibreboards to expand their product ranges.

With the help of the raw material/technology combination that has been developed, fibreboards

of cardboard-like properties can be manufactured, depending on the respective target market. For manufacturers of cardboard produced in the wet process, who consider necessary investments, the results render the possibility to change over to energy-saving and water-saving, therefore more reasonable technologies for the manufacture of cardboard in the dry process and thus to generate an increase in competitive benefits.

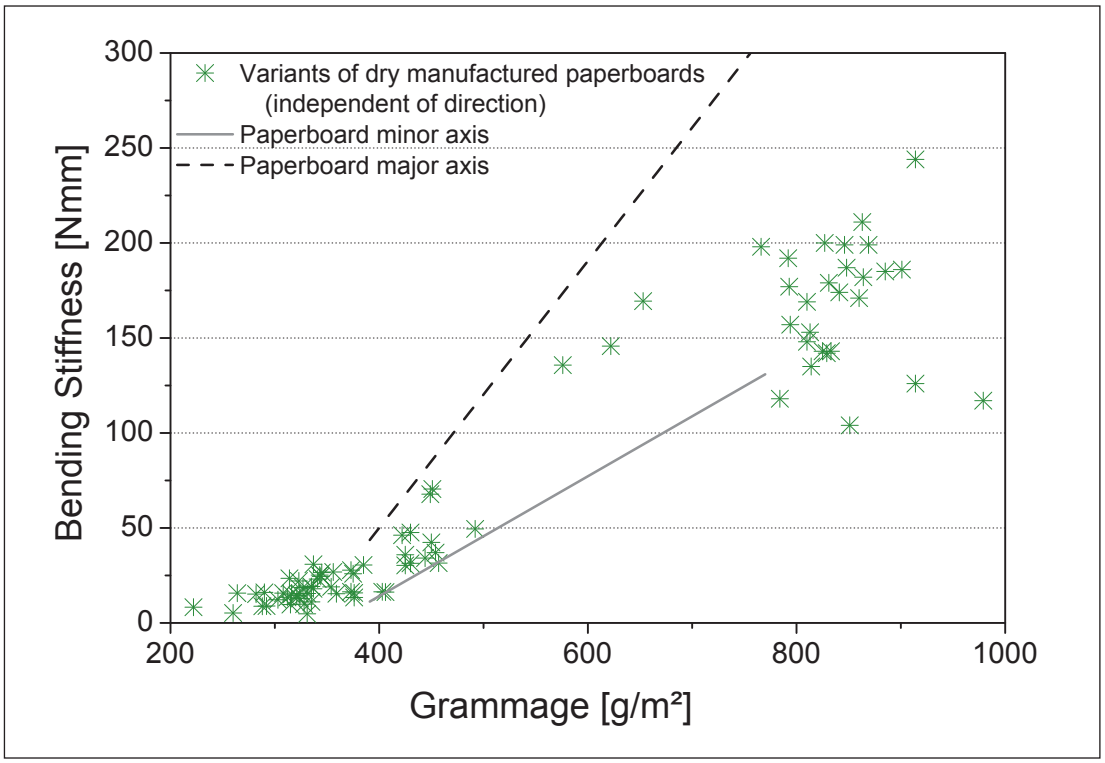

Fig. 2: Bending stiffness of the dry cardboard variants as compared to grey board in the main and side lines depending on grammage (main line: in manufacturing direction; side line: transverse to manufacturing direction)